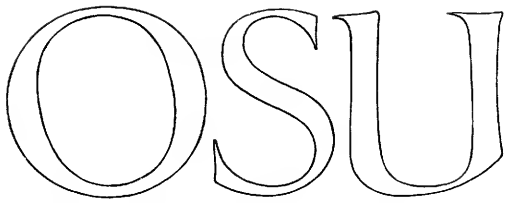
cc-68-25

Using the Plotter: Documentation and Examples

by Jo Ann Baughman and C. Dean Pielstick

July, 1968



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THE CALCOMP

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PART I

THE CALCOMP 1627 II PLOTTER

A CALCOMP 1627 II drum plotter with a 30-inch paper width is attached to the CDC 3300. To permit more efficient use of the plotter, five plot subroutines are in the OS-3 Fortran Library. There are three types of subroutines. The types and their names are:

Type	Subroutine
Axis Definition	AXISXY, SAXES
Pen Movement	PLOTXY, RESET
Labeling	LABEL

Since the plotter can only move in eight directions in increments of 0.01 inch, the output is buffered to increase efficiency.

As a rule, it is not a good idea to retrace plots. The algorithm used to determine which direction to go may be out of phase on the way back and give a double line.

The plotter is equipped by a $\frac{7}{8}$EQUIP, (lun) = PLOT where (lun) is the logical unit number.

When finished plotting, a call to AXISXY (or SAXES, if it was used to define the axes) with LUN = 0, empties the buffer and performs the necessary housekeeping to terminate a plot. This, used only once, is the last call for every program.

In plotting from the teletypewriter, LUN may be equipped as a file, i.e., #EQUIP,LUN = FILE. Plotter information will be stored on this file which may be released if data is found to be in error. The file is plotted by #EQUIP, no. = PLOT and #COPY, I = LUN,O = no.

TERMS

(lun): Logical unit number of the output device. Used for LUN and in EQUIP statement.

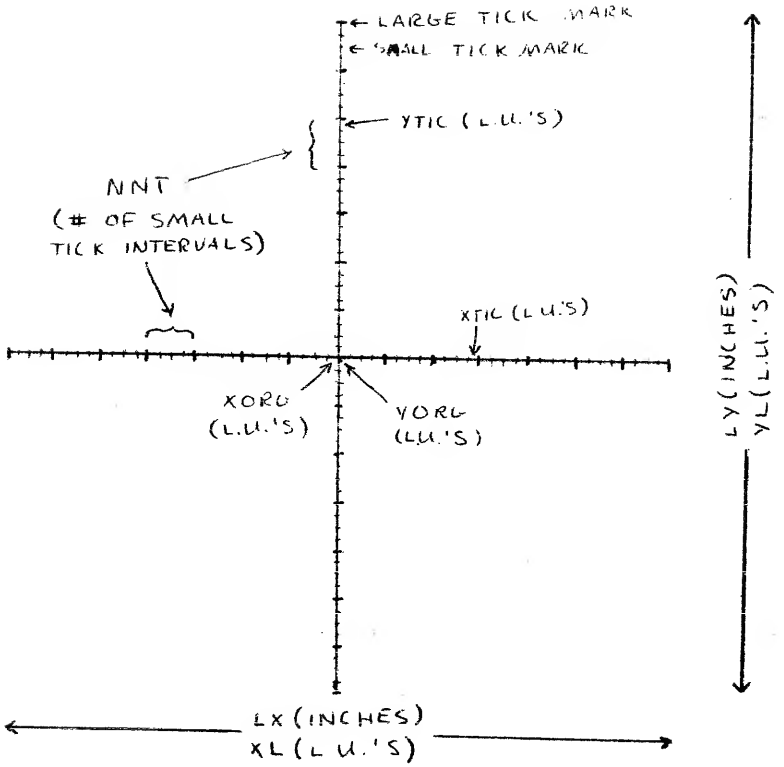
Tick mark: A mark on an axis to indicate minor and major intervals. They are marked during axis plotting as a function of AXISXY.

Logical unit: A unit interval which represents the data to be graphed. For example, a 20 inch axis may be divided into 200 logical units from -100 to +100, 2 logical units from 0 to +2, or as required to plot the graph. The units need not be the same for both axes.

Origin: The point where the X and Y axes cross, usually but not necessarily (0,0), in terms of logical units. Other examples are:

X = 1960, Y = $1 million
X = -10 , Y = 35
X = 163 , Y = 0

A.



B.

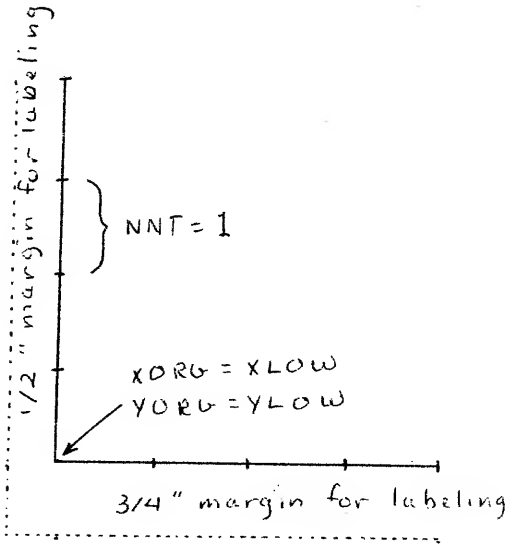


Figure 1
Illustrations of Plotting Parameters

I. AXIS DEFINITION (AXISXY,SAXES)

This function defines the axes and in the case of AXISXY, draws and marks major and/or minor intervals on them.

Form:

```
IF(AXISXY(LUN,LX,LY,XTIC,XL,YL,XLOW,YLOW,XORG,YORG,YTIC,NNT))n,m
```

Where "n" and "m" are statement labels. The function branches to "n" if the parameter list is legal and to "m" if one or more parameters are illegal, which will result in a diagnostic. The programmer should then terminate the last plot with a call to AXISXY (or SAXES) with LUN = 0. The IF statement may also be used as a three way branch, if desired. SAXES uses the same parameter list, but does not draw the axes and tick marks.

PARAMETERS	TYPE	
LUN	(I)	The logical unit number for the output device, which must have been previously defined in a 7 8EQUIP statement, for either the plotter or magnetic tape. Examples: 7 8EQUIP,01 = PLOT 7 8EQUIP,31 = MT, 6437 with write ring.
LX	(I)	Length of X-Axis in inches (1-27).
LY	(I)	Length of Y-Axis in inches (1-200).
XTIC	(F.P.)	Interval between tick marks on the X-Axis in logical units.
XL	(F.P.)	Length of X-Axis in logical units.
YL	(F.P.)	Length of Y-Axis in logical units.

PARAMETERS	TYPE	
XLOW	(F.P.)	Lowest value on the X-Axis (may be negative) in logical units.
YLOW	(F.P.)	Lowest value on the Y-Axis (may be negative) in logical units.
XORG	(F.P.)	X-Axis origin in logical units.
YORG	(F.P.)	Y-Axis origin in logical units.
YTIC	(F.P.)	Optional. Interval between tick marks on the Y-Axis in logical units.
NNT	(I)	Optional. Number of small tick intervals within each large tick interval. (Small for both axes.)

II. PEN MOVEMENT (PLOTXY, RESET)

PLOTXY: This function moves the pen from its present position to the set of coordinates specified in the call.

Form:

```
IF(PLOTXY(X,Y,IPOS,IMARK))n,m
```

Where "n" is the branch for legal parameters and "m" is the branch for illegal parameters as in AXISXY.

or CALL PLOTXY(X,Y,IPOS,IMARK)

A call for movement to new coordinates outside the boundaries as defined by AXISXY will result in diagnostics. One-half inch and three-fourths inch borders are provided for labeling purposes to the left of XLOW and below YLOW, respectively. However, when the Y value is too high, the "upper limit" value replaces the value in the call so that

the pen will not go beyond the upper limit. The same is true of the right-hand limit. Therefore, the programmer should terminate plotting when the values go beyond these limits.

PARAMETERS	TYPE	
X	(F.P.)	The new X-coordinate in logical units
Y	(F.P.)	The new Y-coordinate in logical units
IPOS	(I)	Pen position during movement. 0 = pen up (off of paper between points; use for plotting points or moving pen to labeling position), 1 = pen down (on paper between points; draws a connecting line between successive coordinates).
IMARK	(I)	Data mark (if any). Values 1-32 generate marks, other values do not. Odd numbers define small marks (2-4 0.01 inch increments long), marks defined by even numbers correspond to marks defined by odd numbers, but are twice as large.

NUMBER	DATA MARKS	MARK
1-2	up arrow, datum at the point.	↑
3-4	right arrow, datum at the point.	→
5-6	down arrow, datum at the point.	↓
7-8	left arrow, datum at the point.	←
9-10	vertical cross, datum at its center.	+
11-12	X within a box, datum at its center.	⊠

NUMBER	DATA MARK	MARK
13-14	hourglass dot, datum at lower left corner.	X
15-16	diagonal cross, datum at the center.	X
17-18	vertical caret, datum at the point.	v
19-20	horizontal caret, datum at the point.	>
21-22	right angle, L orientation, datum at point.	L
23-24	same, turned 180 degrees, datum at point.	⅂
25-26	tee, on its side, datum at intersection.	⊢
27-28	tee, datum at intersection.	T
29-30	vertical bar, datum at its center.	I
31-32	horizontal bar, datum at its center.	-

There are numerous methods of plotting a graph. Generally, however, the X value is incremented and the corresponding Y value is either calculated or read in from an array where it was previously stored. It should be remembered that the plotter can increment a minimum of 0.01 inches.

RESET: This function can be used to move the pen in the + or - Y direction.

Form:

CALL RESET (ISPACES,LUN)

The primary use for the RESET function is to reset the pen for labeling the plot below the boundaries. Since the function redefines the axes such that the point to which it is moved becomes (0,0), it should be used with care, normally after plotting is completed.

PARAMETERS	TYPE	
ISPACES	(I)	The number of 0.01 inch increments to move in the Y-direction. Positive is for plus Y, negative for minus Y directions.
LUN	(I)	Logical unit number.

III. LABELING (LABEL)

LABEL: This function may be used to draw alphanumeric characters and symbols on the plotter. It is the responsibility of the programmer to position the pen for each label and make sure that the label will fit on the plotting surface. Labels are not restricted by the right hand axis boundary, but by the paper width. When this limit is reached, the pen returns to the label's starting X-position, one line down, and continues labeling. The data must be read into an array. Since it must be in BCD, an ENCODE may be necessary (See sample program).

Form:

```
CALL LABEL(INUM,ISIZE,IDIR,IARRAY(I))
```

PARAMETERS	TYPE	
INUM	(I)	The integer number of characters to be plotted by that call, including spaces.

ISIZE	(I)	Size of characters to be plotted, 1 - 10. Size 1 is approximately 1/12 inch square, others are appropriate multiples of this size.
IDIR	(I)	Direction of character line. 0 = +X, 1 = -Y, 2 = -X, 3 = +Y (other values undefined) e.g., this line is in the +X direction for normal axes.
IARRAY(I)*		Starting word address of the data to be plotted, i.e., the label(s).

TYPE* depends on the type of the array used.

This function is used both for labeling the axes and the plot, i.e., information about the plot such as the function it represents, the scale used, date, name, etc. The function must be reset for each new label position.

IV. DIAGNOSTICS

The programmer should terminate plotting for illegal parameters, which will cause diagnostics. It is often helpful to print values when they are illegal.

AXISXY: AXSXY ERROR XX PLOT N, E.P. YYYYY,ZZZZZZZZ

XX = Parameter in error.

00 = LUN
01 = LX (NOTE: there is no 03)
02 = LY

04 = XL

05 = YL

06 = XORG

07 = YORG

LUN error terminates job with undefined logical unit.

XLOW and YLOW give PLOTXY error messages.

XTIC, YTIC, and NNT give no messages, but prevent plotting.

N = Plot number.

YYYYY = Octal location from which AXISXY was called.

ZZZZZZZZ = Octal representation of illegal parameter (upper 24 bits if floating point).

PLOTXY: PLTXY ERROR XX PLOT N, E.P. YYYYY, ZZZZZZZZ

XX = Error number.

1 = X parameter too high

2 = X parameter too low

3 = Y parameter too high

4 = Y parameter too low

N = Plot number.

YYYYY = Octal location from which PLOTXY was called.

ZZZZZZZZ = Octal representation of upper 24 bits of illegal floating point parameter.

RESET: (Reset errors are essentially irrecoverable).

RESET ERR X

The logical unit specified is illegal

X = 1, not within range 1-49.

X = 2, unit has not been assigned.

X = 3, unit is not plotter or magnetic tape.

X = 4, actual equipment differs from last call.

V. COMMENTS

The plot or series of plots may be labeled with a "$^{7}_{8}$LABEL, (lun)/information", control card following the statement which equips the plotter = lun. "Information" may be any alpha-numeric information, commas, and periods, such as SAVE FOR DEAN, PROG PLOT. The LABEL subroutine, as described above, also includes symbols.

It is often advantageous to print out values used in the above subroutines, especially during the debugging stage.

Many parts of a plot may be handled in subroutines. An extensive set of subroutines has been written to handle items such as axes labeling, multiple plots, log scales, outlines, keys, etc.

In addition, plots may be turned at 90 degree angles to allow a longer X axis. Plotting and labeling must be accounted for accordingly. Two plots may be located side by side only when the second is plotted with respect to the originally defined axes, or by turning the axes 90 degrees and plotting one above the other. The second graph to be plotted will appear above the first. Therefore, one should consider which direction, clockwise or counter-clockwise, to rotate the axes for appropriate positioning.

VI. SAMPLE PROGRAM

```
      PROGRAM SAMPLE
      DIMENSION IARRAY(10)
      READ(60,1)LUN,LX,LY,XTIC,XL,YL,XLOW,YLOX,XORG,YORG,YTIC
    1 FORMAT(3I2,8F5.1)
      IF(AXISXY(LUN,LX,LY,XTIC,XL,YL,XLOW,YLOW,XORG,YORG,YTIC))4,13
    4 READ(60,7) (IARRAY(I),I=1,10)
      X=XLOW
      DO 100 I=1,5
      CALL PLOTXY(X,-.2,0,0)
      X=X+XTIC
      ENCODE(4,6,LIST)IARRAY(I)
    6 FORMAT(I4)
  100 CALL LABEL(4,1,0,LIST)
      Y=YLOW
      DO 200I=6,10
      CALL PLOTXY(-.4,Y,0,0)
      Y=Y+YTIC
      ENCODE(4,6,LIST)IARRAY(I)
  200 CALL LABEL(4,1,0,LIST)
      IPOS=1
      X=XLOW
      DO 300 I=1,50
      Y=X**2
      CALL PLOTXY(X,Y,IPOS,1)
```

```
300   X=X+.1
      IF(AXISXY(0,0,0,0,0,0,0,0,0,0))13,13
 13   CALL EXIT
  7   FORMAT(5I4)
      END
```

PART II

ABSTRACTS OF

READY-MADE

PLOT PROGRAMS

PART II

ABSTRACTS OF READY-MADE PLOT PROGRAMS

CONTENTS (Subroutines)

This section provides an abstract of subroutines which are on Public File. These have been written to aid the programmer in plotting. The programmer need only provide the values called for

in the parameter list and call the subroutine, which then does the plotting, labeling, etc.

Comments:

These routines are on public file and may be equipped as follows:

```
7
8EQUIP,1 = *name      (NOTE: Asterisk denoting public
   :                         file.)
 PROGRAM
   :
77
88
7
8LOAD,56,1            (NOTE: The public file program
 RUN                       or subroutine is loaded,
   :                       too.)
 DATA (if any)
```

Routine	Equip and Load
MLTIPLT	*MLTIPLT *PLTRTNS
LOG1	*LOG1 *PLTRTNS
LOG2	*LOG2 *PLTRTNS
LOG3	*LOG3 *PLTRTNS
LABELX,LABELY,LABELS, OUTLINE,GRID,KEY1,KEY2	*PLTRTNS**
GRAPHIC,CENTAR	*GRAPHIC**
AXPLTI,AXPLTF,SCALEPLT, NAME,ENCLOSE,GRIDMARK	*PLTSUBS**

**Routines may be loaded individually or in any combination after they are equipped. (See following page.)

To load part of a public file subroutine package, use the following sequence of commands (for remote users only):

1. #EQUIP,2=*name
2. #EQUIP,3=FILE
3. #EQUIP,4=FILE
4. #*REMOVE,I=2,R=3,O=4
5. List names of routines you want one per line (CR) (LF)
6. * (CR) (LF)
7. #REWIND,3

Subroutine AXPLTF, AXPLTI

Purpose:

Writes a label at specified tick marks on the dependent and independent axes. AXPLTF writes a floating point label according to F4.1. AXPLTI writes an I4 integer label.

Usage:

```
CALL AXPLTF(LX,LY,PDATA)
```

This subroutine requires no common storage.

Description of parameters:

LX,LY	Physical size of plot.
PDATA(1) thru PDATA(13)	Same parameters as used in GRAPHIC p. 21.
PDATA(14)	Multiple of tick marks to label.
Example:	If it is equal to 1 the subroutine writes at every tick mark. If it is equal to 2 it writes at every other tick mark.
	PDATA Dimensioned as PDATA(20).

Remarks: Subroutines AXPLTF and AXPLTI were written by J.A. Baughman in Fortran IV (CDC 3300).

Subroutine CENTAR

Purpose:

Strips off leading BCD blanks from first N characters of character array C1 and stores in C2. Returns NU, the number of characters found from first non-blank character to last. Maximum size of character array is 96.

Usage:

```
CALL CENTAR(C1,C2,N,NU)
```

In one call C1 may be same variable as C2, i.e.

```
CALL CENTAR(C,C,N,NU).
```

Remarks: Subroutine CENTAR was written by J.A. Baughman in Fortran IV (CDC 3300).

Subroutine ENCLOSE

Purpose:

Subroutine ENCLOSE constructs a boundary around a plot.

Usage:

A call must be made to AXISXY prior to a call to ENCLOSE. ENCLOSE is the main and only entry point: CALL ENCLOSE (PDATA). PDATA must be dimensioned (10).

Description of parameters: (Same as for AXISXY)

PDATA(1)	must equal XL - the length of the X axis in logical units.
PDATA(2)	must equal YL - the length of the Y axis in logical units.
PDATA(3)	must equal XLOW - initial point on X axis in logical units.
PDATA(4)	must equal YLOW - initial point on Y axis in logical units.
PDATA(5)	must equal XORG - X axis origin.
PDATA(6)	must equal YORG - Y axis origin.
PDATA(7)	must equal XTIC - the interval between tick marks on the X axis in logical units.
PDATA(8)	must equal YTIC - the interval between tick marks on the Y axis in logical units.

Remarks:

Subroutine ENCLOSE was written by J. A. Baughman in Fortran IV (CDC 3300). A call must be made to AXISXY or SAXES prior to

a call to ENCLOSE. The method consists of successive calls to PLOTXY. When the operation is completed the message "graph enclosed" will be typed out.

PDATA must be dimensioned.

Subroutine GRAPHIC

Purpose:

Draws N curves on a plot and labels the dependent and independent axis with alphanumeric information and writes a graph title at a user specified location.

Usage:

CALL GRAPHIC(X,Y,L,N,LX,LY,PDATA).

This call is made on the first and only call to Graphic.

CALL DUPLOT(X,Y,L,N,LX,LY,PDATA).

This call is used for additional curves to be drawn. Duplot is second entry point to Graphic.

Description of parameters:

X	independent variable. dimensioned X(N).
Y	dependent variable. dimensioned Y(N).
L	dimensioned as L(60). If L(1) = 0 program will not draw graph title. If L(21) = 0 program will not draw X axis title. If L(41) = 0 program will not draw Y axis title. L(2), L(3) = X, Y position of graph title. L(4), L(20) = Graph title. L(24), L(40) = X axis title. L(44), L(60) = Y axis title. Titles contain alphanumeric information.
N	Number of data points.
LX,LY	Physical size of the plot as described in Part I, p. 4.

PDATA Dimensioned as PDATA(20) contains parameters necessary to plot as described in Part I, p. 4.

PDATA(1) = XL
PDATA(2) = YL
PDATA(3) = XLOW
PDATA(4) = YLOW
PDATA(5) = XORG
PDATA(6) = YORG
PDATA(7) = XTIC
PDATA(8) = YTIC
PDATA(9) = NNT
PDATA(10) = IDUP This parameter must be zero on last or only call to Graphic.
PDATA(11) = IMARK
PDATA(12) = ISIZE
PDATA(13) = IPEN

Remarks:

GRAPHIC calls Subroutine CENTAR. This subroutine terminates plotting after five PLOTXY errors have been made and returns control to the calling program. The X and Y values in error are printed out on LUN61. GRAPHIC plots on LUN16. Subroutine GRAPHIC was written by J.A. Baughman in Fortran IV (CDC 3300).

Subroutine GRID

Purpose:

To plot a line grid on the plotting surface of horizontal lines, vertical lines or both.

Usage:

```
CALL GRID(ID,XLOW,YLOW,XHIGH,YHIGH,XMARK,YMARK,XPOINT,
YPOINT,AFACT,BFACT,XORG,YORG)
```

Description of parameters:

ID — Identification factors:

ID(1) = number of curves to be plotted.
ID(2) = number of points for curve.
ID(3) = key choice for multiple graphs.
= 0 for no key.
= 1 for key.
ID(4) = IPOS(from PLOTXY) for plot*.
= 0 pen up.
= 1 pen down.
ID(5) = IMARK(from PLOTXY)*.
= 1 to 32.
ID(6) = grid choice
= 0 for no grid.
= 1 for grid.
ID(7) = grid lines
= 0 for no lines.
= 1 for horizontal lines.
= 2 for vertical lines.
= 3 for both.
ID(8) = graph type*
= 1, XLOW ≠ XORG, YLOW ≠ YORG +
= 2, XLOW = XORG, YLOW = YORG └
= 3, XLOW = XORG, YLOW ≠ YORG ├
= 4, XLOW ≠ XORG, YLOW = YORG ┴

---

*See description of library routines and their parameters, Part I, pp. 4-5.

XLOW	Low X-axis value in logical units.
YLOW	Low Y-axis value in logical units.
XHIGH	High X-axis value calculated by XL + XLOW.
YHIGH	High Y-axis value calculated by YL + YLOW.
XMARK	An array of points along the X-axis at which vertical lines may be drawn.
YMARK	An array of points along the Y-axis at which horizontal lines may be drawn.
XPOINT	The X-coordinate for the bottom of a key, equals XHIGH if no key is specified. Calculated by XHIGH-30/12.*AFACT.
YPOINT	The Y-coordinate for the left margin of a key, equals YHIGH if no key is specified. Calculated by YHIGH-(4+ID(1))*.15*BFACT.
AFACT	A conversion factor from logical units to inches for X-axis, calculated by XL/LX.
BFACT	Same for Y-axis, calculated by YL/LY.
XORG	X-axis origin in logical units.
YORG	Y-axis origin in logical units.

Remarks:

The XMARK array may be generated for linear scales by incrementing XLOW by XTIC or some other value, ATIC. Similarly the YMARK array may be generated for linear scales by incrementing YLOW by YTIC or some other value, BTIC. These arrays must terminate with values equal to or greater than their respective XHIGH and YHIGH values. For examples of use see MLTIPLT and LOG1 in Part III. Written by C.D. Pielstick.

Subroutines required:

None.

Subroutine GRIDMARK

Purpose:

Subroutine GRIDMARK places gridmarks on a plot in the first quadrant.

Usage:

PDATA must be dimension (20). A call must be made to AXISXY, or SAXES prior to the call to GRIDMARK. Gridmark is the main and only entry point: CALL GRIDMARK (TINC, FINC, PDATA).

Description of parameters:

TINC	the increment for the X-axis (time) gridmarks.
FINC	the increment for the Y-axis (function) gridmarks.
PDATA(1)	must equal the length of the X-axis in logical units (XL).
PDATA(2)	must equal the length of the Y-axis in logical units (YL).
PDATA(5)	must equal the X-axis origin (XORG).
PDATA(6)	must equal the Y-axis origin (YORG).

Remarks:

Subroutine GRIDMARK was written by J. A. Baughman in Fortran IV (CDC 3300). The method consists of successive calls to PLOTXY. The boundary is made first and contains gridmarks, then the gridmarks are made in the first quadrant. After the operation is completed the pen is returned to the origin.

Subroutines KEY1 and KEY2

Purpose:

To plot a key in the upper right-hand corner of a graph of multiple plots indicating the data mark used, the X-axis scale factor, and the Y-axis scale factor. They are arranged in order of plotting. KEY1 plots the headings, and KEY2 plots the data marks and scale factors (in F5.2 format).

Usage:

```
CALL KEY1(AFACT,BFACT,ARRAY1,ARRAY2,XHIGH,YHIGH)

CALL KEY2(AFACT,BFACT,ID(5),J,XHIGH,YHIGH,XSF,YSF)
```

Description of parameters:

AFACT	A conversion factor from logical units to inches for X-axis, calculated by XL/LX.
BFACT	Same for Y-axis, calculated by YL/LY.
XHIGH	High X-axis value, calculated by XL + XLOW.
YHIGH	High Y-axis value, calculated by YL + YLOW.
ID(5)	(See ID array from MLTIPLT p. 37) IMARK from PLOTXY.
J	A counter, equals 1 for first call. Subroutine increases J by one for each call. The value is used by the subroutine in determining the position for printing information in the key. J should never be changed outside the subroutine.
XSF	Scale factor for X-axis such that XSF times one new logical unit = one old logical unit (= 1 for first plot).
YSF	Same for Y-axis (= 1 for first plot).

ARRAY1	An array containing "KEY FOR PLOTS."
ARRAY2	An array containing "DATA MARK (6 spaces) XSF (6 spaces) YSF."

Remarks:

An outline of the key may be plotted using XHIGH, YHIGH, XPOINT, and YPOINT. For examples of use see MLTIPLT and LOG1. The programmer should note that the parameter "J" is set equal to one on the first call, but is not changed externally. It is, however, increased by one for each call, e.g. J = 2 after first call; J = 3 after second call, etc. Subroutines KEY1 and KEY2 were written by C.D. Pielstick in Fortran IV (CDC 3300).

Subroutines required:

None.

Subroutine LABELS

Purpose:

To label the X and Y axes and the plot as a whole with not more than 80 alphanumeric characters and/or symbols.

Usage:

CALL LABELS(XLOW,YLOW,XHIGH,YHIGH,AFACT,BFACT,IA,IDENT).

Description of parameters:

See descriptions of OUTLINE, p. 41, for all except the following:

IA	An array in 60A4 format (must be dimensioned to 60) with 1-20 containing 80 character positions for the Y-axis label, 21-40 containing 80 character positions for the X-axis label, and 41-60 containing 80 character positions for the plot label.
IDENT	An array (must be dimensioned to 3) containing the lengths, including blanks, of the above 3 labels and in that order.

Remarks:

The "plot" label has character size (ISIZE) = 3. Therefore, the length of the label should be considered carefully. For examples of use see MLTIPLT and LOG1. Written by C.D. Pielstick.

Subroutines required:

None.

Subroutine LABELX

Purpose:

To label the X-axis of any linear graph in F4.1 format according to specifications of the parameter list.

Usage:

CALL LABELX(XVALUE,XINCRMT,XSTART,XHIGH,ATIC,AFACT,BFACT, ID(8), YORG).

Description of parameters:

See abstract of MLTIPLT, p. 37 for all except the following:

XHIGH	The high X-axis value, calculated by XL + XLOW.
AFACT	A conversion factor from logical units to inches for X-axis, calculated by XL/LX.
BFACT	Same for Y-axis, calculated by YL/LY.

Remarks:

Care should be taken to space labels appropriately with ATIC. Since a maximum value of 99.9 can be plotted, the programmer may label axis with appropriate fractions such as 1.0 or 10.0 for 100.0. The change may be noted by labeling the axis appropriately, i.e. X-axis - Units = 10* label value. (See LABELS). For examples of use, see MLTIPLT and LOG1. Written by C.D. Pielstick.

Subroutines required:

None.

Subroutine LABELY

Purpose:

To label the Y-axis of any linear graph in F4.1 format according to specifications of the parameter list.

Usage:

CALL LABELY(YVALUE,YINCRMT,YSTART,YHIGH,BTIC,AFACT,BFACT, ID(8),XORG)

Description of parameters:

See abstract of MLTIPLT, p. 37 for all except the following:

YHIGH	The high Y-axis value, calculated by YL + YLOW.
AFACT	A conversion factor from logical units to inches for X-axis, calculated by XL/LX.
BFACT	Same for Y-axis, calculated by YL/LY.

Remarks:

See LABELX. Labels are spaced with BTIC. For examples of use see MLTIPLT, page 37. Subroutine LABELY was written by C.D. Pielstick in Fortran IV (CDC 3300).

Subroutines required:

None.

Subroutine LOG1

Purpose:

To plot one or more sets of data on one set of X-Y axes (Y values >0) with a common log scale Y-axis. The plot is labeled, outlined and includes GRID and KEY options. The first plot defines the axes and the units; others are scaled accordingly.

Usage:

CALL LOG1 (XDATA,YDATA)

This is the first call; defines and plots one graph.

XDATA = array of independent variable coordinates

YDATA = array of dependent variable coordinates

CALL LOGA (XDATA,YDATA)

This is the entry for each additional graph.

COMMON...

(See subroutine MLTIPLT for parameters and description, p. 37. They are identical.)

Remarks:

The user must dimension XDATA and YDATA to the number of points to be plotted. Also, the user must terminate the plot unless AXISXY is in error. This allows the programmer to do extra labeling, for example, before the plot is terminated. Since YLOW = YORG for this log scale, ID(8) must = 2 or 4, usually 2.

The AXISXY parameter list is printed on the line printer. Incorrect data values are also printed. Subroutine LOG1 was written by C.D. Pielstick in Fortran IV (CDC 3300).

Subroutines required:

LABELX, LABELS, OUTLINE, GRID, KEY1, KEY2.

Subroutine LOG2

Purpose:

To plot one or more sets of data on one set of X-Y axes (Y values >0) with a common log scale X-axis. The plot is labeled, outlined and includes grid and key options. The first plot defines the axes and the units; others are scaled accordingly.

Usage:

CALL LOG2 (XDATA,YDATA)

This is the first call; defines and plots one graph.

XDATA = array of independent variable coordinates
YDATA = array of dependent variable coordinates

CALL LOGB (XDATA,YDATA)

This is the entry for each additional graph.

COMMON...

(See subroutine MLTIPLT, p. 37 for parameters and description. They are identical.)

Remarks:

The user must dimension XDATA and YDATA to the number of points to be plotted. Also, the user must terminate the plot unless AXISXY is in error. This allows the programmer to do extra labeling, for example, before the plot is terminated. Since XLOW = XORG for this log scale, ID(8) must = 2 or 3,

usually 2. The AXISXY parameter list is printed on the line printer. Incorrect data values are also printed. Subroutine LOG2 was written by C.D. Pielstick in Fortran IV (CDC 3300).

Subroutines required:

LABELY, LABELS, OUTLINE, GRID, KEY1, KEY2.

Subroutine LOG3

Purpose:

To plot one or more sets of data on one set of X-Y axes (X and Y values >0) with common log scale axes. The plot is labeled, outlined and includes grid and key options. The first plot defines the axes and the units; others are scaled accordingly.

Usage:

```
CALL LOG3 (XDATA,YDATA)
```

This is the first call; defines and plots one graph.

XDATA = array of independent variable coordinates
YDATA = array of dependent variable coordinates

```
CALL LOGC (XDATA,YDATA)
```

This is the entry for each additional graph.

```
COMMON ID(8),NNT,LUN,LX,LY,XMIN,YMIN,XMAX,YMAX,XSF,YSF,
IA(60),IDENT(3)
```

(See subroutine MLTIPLT, p. 37 for parameters and description. They are identical. Note that this COMMON consists of the first 12 and last 6 parameters in the MLTIPLT list.)

Remarks:

The user must dimension XDATA and YDATA to the number of points to be plotted. Also, the user must terminate the plot unless AXISXY is in error. This allows the programmer to do extra labeling, for example, before the plot is terminated. Since XLOW =

XORG and YLOW = YORG for this subroutine ID(8) must = 2. The AXISXY parameter list is printed on the line printer as are incorrect data values. Subroutine LOG3 was written by C.D. Pielstick in Fortran IV (CDC 3300).

Subroutines required:

LABELS, OUTLINE, GRID, KEY1, KEY2.

Subroutine MLTIPLT

Purpose:

To plot one or more sets of data on one set of X-Y axes with different scaling and with labeling and outline. Includes GRID and KEY options. The first plot defines the axes and the units; others are scaled accordingly.

Usage:

CALL MLTIPLT (XDATA,YDATA)

This is the first call; defines and plots one graph.

XDATA = an array of independent variable coordinates

YDATA = an array of dependent variable coordinates

CALL GRAPH (XDATA,YDATA)

This call is the entry for each additional graph.

VARIABLES IN COMMON:

```
COMMON ID(8),NNT,LUN,LX,LY,XL,YL,XLOW,YLOW,XORG,YORG,
XTIC,YTIC,XVALUE,YVALUE,XINCRMT,YINCRMT,XSTART,YSTART,
ATIC,BTIC,XMIN,YMIN,XMAX,YMAX,XSF,YSF,IA(60),IDENT(3)
```

or

```
COMMON IARRAY(12),ARRAY(22),LABELS(63)
```

where the three arrays correspond to 1) integer parameters, 2) floating point parameters, and 3) the three labels and their corresponding lengths.

Description of parameters:

ID — Identification factors:
ID(1) = number of curves to be plotted.

ID(2) = number of points for curve.
ID(3) = key choice for multiple graphs.
= 0 for no key.
= 1 for key.
ID(4) = IPOS(from PLOTXY) for plot.*
= 2 for vertical lines.
= 3 for both.
ID(8) = graph type.*
= 1, XLOW ≠ XORG, YLOW ≠ YORG +
= 2, XLOW = XORG, YLOW = YORG ⌊
= 3, XLOW = XORG, YLOW ≠ YORG ⊢
= 4, XLOW ≠ XORG, YLOW = YORG ⊥

NNT thru YTIC*	Define axes and units.
XVALUE	Starting value for labeling X-axis.
YVALUE	Starting value for labeling Y-axis.
XINCRMT	Value to increment XVALUE between labels.
YINCRMT	Value to increment YVALUE between labels.
XSTART	Starting position for labeling X-axis in logical units.
YSTART	Starting position for labeling Y-axis in logical units.
ATIC	Logical units between first characters of two sequential labels on the X-axis, usually equals XTIC or XTIC * NNT (although this routine does not plot NNT).
BTIC	Same for Y-axis.
XMIN	Minimum scaled X-value to be plotted.
YMIN	Minimum scaled Y-value to be plotted.
XMAX	Maximum scaled X-value to be plotted.
YMAX	Maximum scaled Y-value to be plotted.
XSF	Scale factor for X-axis such that XSF times one new logical unit equals one old logical unit (= 1 for first plot).
YSF	Same for Y-axis (= 1 for first plot).

---

*See description of library routines and their parameters, see Part I.

IA(60) An array in 60A4 format with the Y-axis label in 1-20, the X-axis label in 21-40, and the plot label in 41-60. Thus each label has a maximum of 80 characters and/or symbols.

IDENT(3) An array of the exact lengths of the above three labels, including blanks, which must be in that same order.

Remarks:

The user must dimension XDATA and YDATA to the number of points to be plotted. Also, the user must terminate the plot unless AXISXY is in error. This allows the programmer to do extra labeling, for example, before the plot is terminated. The AXISXY parameter list is printed on the line printer. Incorrect data values are also printed.

Usually XVALUE will equal XSTART and XINCRMT will equal ATIC as will also be the case for the corresponding Y-values - YVALUE and YSTART, YINCRMT and BTIC. Differences occur when the label values are scaled rather than actual values. Subroutine MLTIPLT was written by C.D. Pielstick in Fortran IV (CDC 3300).

Subroutines required:

LABELX, LABELY, LABELS, OUTLINE, GRID, KEY1, KEY2.

The subroutines are on public file. See pages 14, 15.

Subroutine NAME

Purpose:

Subroutine NAME is a routine that sets up an axis (call to SAXES) for the specific purpose of labeling.

Usage:

NAME is the main and only entry point: CALL NAME (lun, list, n). List must be dimensioned. NAME was written for a CDC 3300, the language is Fortran IV.

Description of parameters:

LUN	logical unit number that the plot is equipped to.
LIST	the label that will be placed on the plot.
N	integer number of characters to be plotted ($n \leq 80$).

Remarks:

Subroutine NAME was written by J. A. Baughman, (8-13-68). The method consists of subsequent calls to SAXES, PLOTXY, and LABEL. The subroutine may not be used within an AXISXY Plot.

Subroutine OUTLINE

Purpose:

To outline the boundaries of a plot.

Usage:

CALL OUTLINE(ID(8),XLOW,YLOW,XHIGH,YHIGH).

Description of parameters:

ID	ID(8) = graph type.* = 1, XLOW ≠ XORG, YLOW ≠ YORG ┼ = 2, XLOW = XORG, YLOW = YORG └ = 3, XLOW = XORG, YLOW ≠ YORG ├ = 4, XLOW ≠ XORG, YLOW = YORG ┴
XLOW	Low X-axis value in logical units.
YLOW	Low Y-axis value in logical units.
XHIGH	The high X-axis value, calculated by XL + XLOW.
YHIGH	The high Y-axis value, calculated by YL + YLOW.

Remarks:

OUTLINE uses only ID(8). It contains no common or dimensioned variables. For example of use see MLTIPLT and LOG1.

Subroutines required:

None.

---

*See description of library routines and their parameters, Part I, pp. 4-5.

Subroutine SCALEPLT

Purpose:

Calculates the range of the dependent or independent variables and evaluates the parameters needed for scaling the plot drawn by GRAPHIC or needed for a call to AXISXY.

Usage:

CALL SCALEPLT (Y,N,LX,LY,PDATA).

Description of parameters:

X	Data values for X-coordinate variable dimensioning.
Y	Data values for Y-coordinate variable dimensioning specified by calling program.
N	Number of data values to be plotted.
LX,LY	Physical size of plot.
PDATA	As described for subroutine GRAPHIC returns values for PDATA(1)--PDATA(8). PDATA Dimensioned by 20.

Remarks:

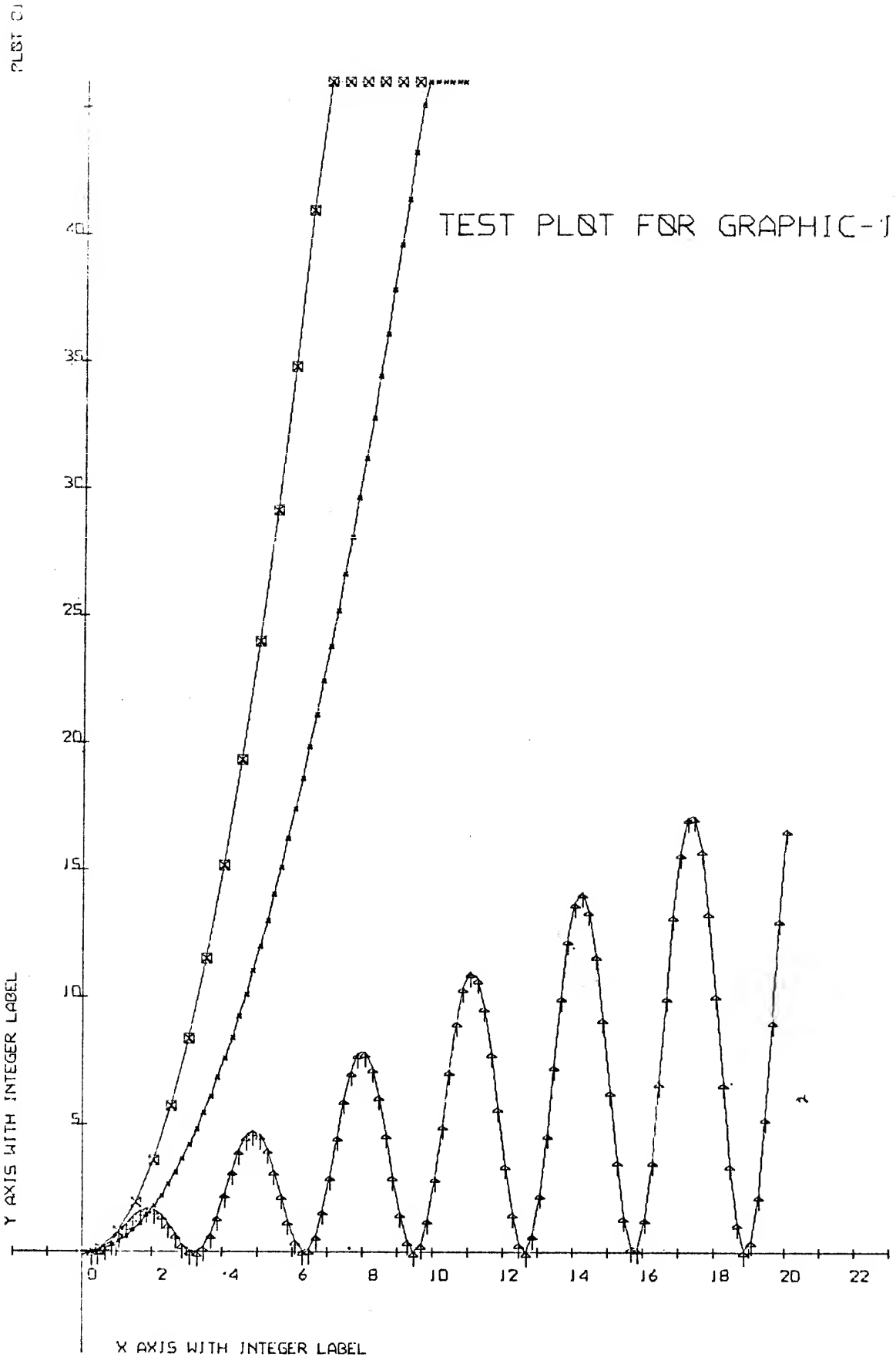
User must supply values for PDATA(9)--PDATA(13) before calling GRAPHIC. Subroutine SCALEPLT was written by J.A. Baughman in Fortran IV (CDC 3300).

PART III

SAMPLE CALLING PROGRAMS WITH THE CURVES THEY CREATED

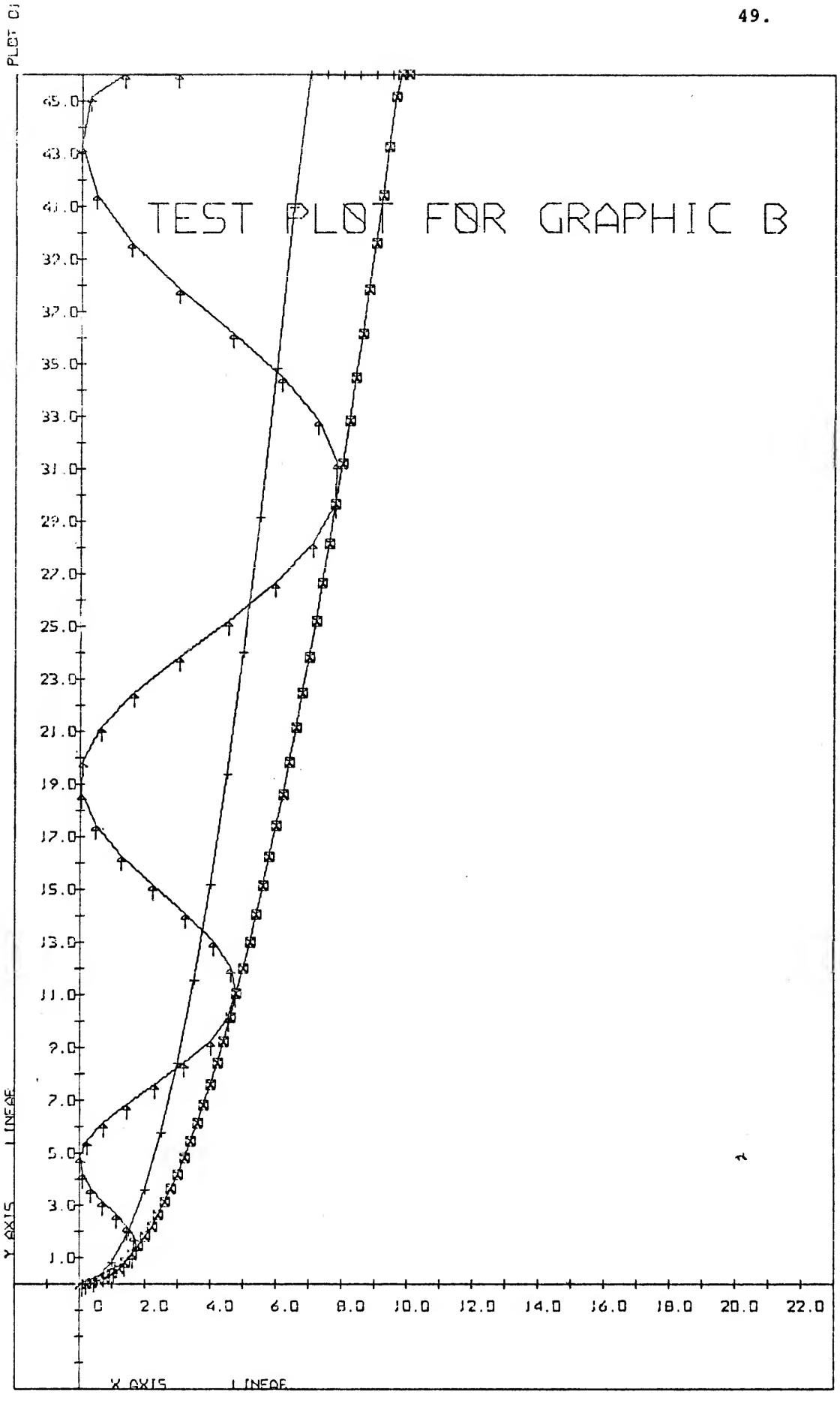
```
'EQUIP,2=*GRAPHIC
'EQUIP,3=*PLTSUBS
'EQUIP,16=PLOT
'FORTRAN,L,X
      PROGRAM TESTPLOT
C
C       ********************
C       TEST PROGRAM FOR GRAPHIC AND AXPLTI.
C       GRAPHIC CALLS SUBROUTINE CENTAR
C
C       PDATA(1) = XL                    PDATA(7) = XTIC
C       PDATA(2) = YL                    PDATA(8) = YTIC
C       PDATA(3) = XLOW                  PDATA(9) = NNT
C       PDATA(4) = YLOW                  PDATA(10)= IDUP
C       PDATA(5) = XORG                  PDATA(11)= IMARK
C       PDATA(6) = YORG                  PDATA(12)= ISIZE
C                                        PDATA(13)= IPEN
C                                        PDATA(14)= AMULT
C
C
C       ********************
C
      DIMENSION X(1000), Y(1000)
      DIMENSION LEGEND(60), PDATA(20)
  100 FORMAT(10E5.1)
  101 FORMAT(I2,2I3,17A4,4X)
  200 FORMAT(1H-,5X5HIMARK,5X5HISIZE,6X4HIPEN,5X5HAMULT,/4F10.2)
    1 FORMAT(1H1,8X2HXL,8X2HYL,6X4HXLOW,6X4HYLOW,6X4HXORG,6X4HYORG,6X4HX
     1TIC,6X4HYTIC,6X4H NNT,/10F10.2)
C       READ IN PLOT INPUT DATA
      READ(60,100) (PDATA(I),I=1,10)
      PDATA(11) = 12.
      PDATA(12) = 2.
      PDATA(13) = 1.
      PDATA(14) = 2.
      LX = 7
      LY = 10
C       WRITE OUT PLOT INPUT DATA
      WRITE(61,1) (PDATA(I), I = 1,10)
      WRITE(61,200) (PDATA(I),I=11,14)
C       READ IN GRAPH TITLE
C       AND  LABELS FOR X AND Y AXIS
      READ(60,101) (LEGEND(I),I=1,60)
      N= 100
      DO 10 I = 1,N
      X(I) = I
      X(I) = X(I)*.5
      Y(I) = X(I)*X(I) - X(I)/5.
   10 CONTINUE
C       PLOT FIRST CURVE
      CALL GRAPHIC(X,Y,LEGEND,N,LX,LY,PDATA)
      CALL AXPLTI(LX,LY,PDATA)
      DO 20 I = 1,N
      X(I) = I
      X(I) = X(I)*.2
      Y(I) = (X(I)*X(I) - X(I)/5.)/2.
   20 CONTINUE
C       SET NEW DATA MARK
```

```
      PDATA(11) = 15.
C        PLOT SECOND CURVE
      CALL DUPLOT (X,Y,LEGEND,N,8,11,PDATA)
      PDATA(10) = 0.
      DO 30 I = 1,N
      A = X(I)
      Y(I) = X(I)*(SIN(A))*SIN(A)
   30 CONTINUE
      PDATA(11) = 2.
C        PLOT THIRD CURVE
      CALL DUPLOT (X,Y,LEGEND,N,8,11,PDATA)
      CALL AXISXY(0,LX,LY,XTIC,XL,XLOW,YLOW,XORG,YORG)
      END
      FINIS
'LOAD,56,2,3
MAP
RUN
 25. 50. -2.  -4.  0.   0.  1.  5. 1.  1.
 2  10 40   TEST PLOT FOR GRAPHIC-I
 1          X AXIS WITH INTEGER LABEL
 1          Y AXIS WITH INTEGER LABEL
''
'LOGOFF
```


TEST PLOT FOR GRAPHIC-1
Y AXIS WITH INTEGER LABEL
X AXIS WITH INTEGER LABEL
0
2
4
6
8
10
12
14
16
18
20
22
5
10
15
20
25
30
35
40

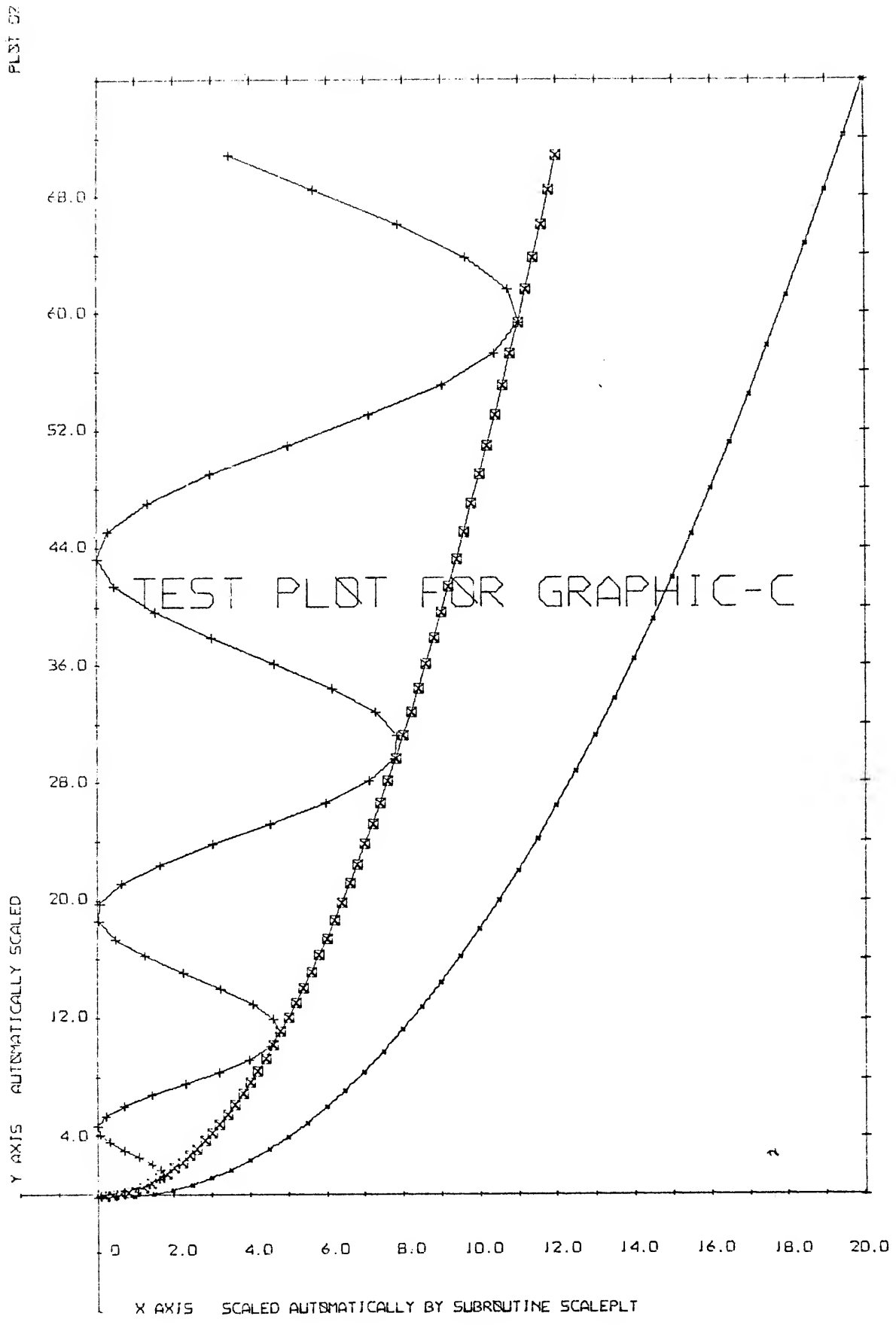
```
      PROGRAM TESTPLOT
C
C     ******************************************
C
C     TEST PROGRAM FOR GRAPHIC AND AXPLTF
C     DREW TEST PLOT FOR GRAPH-B
C
C     PDATA(1) = XL                    PDATA(7) = XTIC
C     PDATA(2) = YL                    PDATA(8) = YTIC
C     PDATA(3) = XLOW                  PDATA(9) = NNT
C     PDATA(4) = YLOW                  PDATA(10)= IDUP
C     PDATA(5) = XORG                  PDATA(11)= IMARK
C     PDATA(6) = YORG                  PDATA(12)= ISIZE
C                                      PDATA(13)= IPEN
C                                      PDATA(14)=AMULT
C     ******************************************
C
      DIMENSION X(1000), Y(1000)
      DIMENSION LEGEND(60), PDATA(20)
C        COMMON PLOT INPUT DATA
      COMMON/DATA/PDATA
      DATA((PDATA(I),I=1,14)=25.,50.,-2.,-4.,0.,0.,
     11.,1.,1.,1.,10.,3.,1.,2.)
C        WRITE OUT PLOT INPUT DATA
      WRITE(61,1) (PDATA(I), I = 1,10)
      WRITE(61,200) (PDATA(I),I=11,14)
  200 FORMAT(1H-,5X5HIMARK,5X5HISIZE,6X4HIPEN,5X5HAMULT,/4F10.2)
    1 FORMAT(1H1,8X2HXL,8X2HYL,6X4HXLOW,6X4HYLOW,6X4HXORG,6X4HYORG,6X4HX
     1TIC,6X4HYTIC,6X4H NNT,/10F10.2)
C        READ IN GRAPH TITLE
C        AND  LABELS FOR X AND Y AXIS
      READ(60,101) (LEGEND(I),I=1,60)
  101 FORMAT(I2,2I3,17A4,4X)
      LX = 7
      LY = 11
      N = 50
      DO 10 I = 1,N
      X(I) = I
      X(I) = X(I)*.5
      Y(I) = X(I)*X(I) - X(I)/5.
   10 CONTINUE
C        PLOT FIRST CURVE
      CALL GRAPHIC(X,Y,LEGEND,N,LX,LY,PDATA)
      CALL AXPLTF(LX,LY,PDATA)
C
      XLOW = PDATA(3)
      YLOW = PDATA(4)
```

```
      XHIGH = PDATA(1) + XLOW
      YHIGH = PDATA(2) + YLOW
C
      CALL OUTLINE(1,XLOW,YLOW,XHIGH,YHIGH)
C
C        SET NEW DATA MARK
      PDATA(11) = 12.
      DO 20 I = 1,N
      X(I) = I
      X(I) = X(I)*.2
      Y(I) = (X(I)*X(I) - X(I)/5.)/2.
 20   CONTINUE
C        PLOT SECOND CURVE
      CALL DUPLOT (X,Y,LEGEND,N,LX,LY,PDATA)
      PDATA(10) = 0.
      DO 30 I = 1,N
      A = X(I)
      X(I) = X(I)*(SIN(A))*SIN(A)
   30 CONTINUE
C        SET NEW DATA MARK
      PDATA(11) = 2.
C        PLOT THIRD CURVE
      CALL DUPLOT (X,Y,LEGEND,N,LX,LY,PDATA)
      CALL AXISXY(0,LX,LY,XTIC,XL,XLOW,YLOW,XORG,YORG)
      END
```


TEST PLOT FOR GRAPHIC B
PLOT O
45.0
43.0
41.0
39.0
37.0
35.0
33.0
31.0
29.0
27.0
25.0
23.0
21.0
19.0
17.0
15.0
13.0
11.0
9.0
7.0
5.0
3.0
1.0
Y AXIS LINEAR
0
2.0
4.0
6.0
8.0
10.0
12.0
14.0
16.0
18.0
20.0
22.0
X AXIS LINEAR

```
      PROGRAM TESTPLOT
      DIMENSION X(1000), Y(1000)
      DIMENSION LEGEND(60), PDATA(20)
      DIMENSION LIST(2)
C
C        ****************************
C        THIS PROGRAM PLOTS GRAPHIC-C
C
C         PDATA(1))=XL          PDATA(7)=XTIC
C         PDATA(2)=YL           PDATA(8)=YTIC
C         PDATA(3)=XLOW         PDATA(9)=NNT
C         PDATA(4)=YLOW         PDATA(10)=IDUP
C         PDATA(5)=XORG         PDATA(11)=IMARK
C         PDATA(6)=YORG         PDATA(12)=ISIZE
C                               PDATA(13)=IPEN
C                               PDATA(14)=AMULT
      PDATA(10) = 1.
      PDATA(11) = 15.
      PDATA(12) = 3.
      PDATA(13) = 1.
      PDATA(14)=2.
C        WRITE OUT PLOT INPUT DATA
      WRITE(61,200) (PDATA(I),I=11,14)
  200 FORMAT(1H-,5X5HIMARK,5X5HISIZE,6X4HIPEN,5X5HAMULT,/4F10.2)
C        READ IN GRAPH TITLE
C        AND  LABELS FOR X AND Y AXIS
      READ(60,101) (LEGEND(I),I=1,60)
  101 FORMAT(I2,2I3,17A4,4X)
      LX = 7
      LY = 10
      LUN = 16
      NL=8
      LIST(1)=4HJO A
      LIST(2)=4HNN
      CALL NAME(LUN,LIST,NL)
      N=40
      DO 10 I = 1,N
      X(I) = I
      X(I) = X(I)*.5
      Y(I) = (X(I)*X(I) - X(I))/5.
   10 CONTINUE
C        SCALE FOR PLOTTING
      CALL SCALEPLT(X,Y,N  ,LX,LY,PDATA)
C
C        PLOT FIRST CURVE
      CALL GRAPHIC(X,Y,LEGEND,N,LX,LY,PDATA)
      CALL AXPLTF(LX,LY,PDATA)
C
      CALL ENCLOSE(PDATA)
C
```

```
      N = 50
      DO 20 I = 1,N
      X(I) = I
      X(I) = X(I)*.2
      Y(I) = (X(I)*X(I) - X(I)/5.)/2.
 20   CONTINUE
C        SET NEW DATA MARK
      PDATA(11) = 12.
C        PLOT SECOND CURVE
      CALL DUPLOT (X,Y,LEGEND,N,8,11,PDATA)
      DO 30 I = 1,N
      A = X(I)
      X(I) = X(I)*(SIN(A))*SIN(A)
   30 CONTINUE
      PDATA(10) = 0.
C         SET NEW DATA MARK PDATA(11)=10.
      PDATA(11)=10.
C         PLOT THIRD CURVE
      CALL DUPLOT (X,Y,LEGEND,N,8,11,PDATA)
 3    WRITE(61,2)
C
   2  FORMAT(1H-,19HEND OF GRAPHIC PLOT)
      CALL AXISXY(0,LX,LY,XTIC,XL,XLOW,YLOW,XORG,YORG)
      END
         FINIS
```


PLOT 52
TEST PLOT FOR GRAPHIC-C
68.0
60.0
52.0
44.0
36.0
28.0
20.0
12.0
4.0
Y AXIS AUTOMATICALLY SCALED
0
2.0
4.0
6.0
8.0
10.0
12.0
14.0
16.0
18.0
20.0
X AXIS SCALED AUTOMATICALLY BY SUBROUTINE SCALEPLT

DATA IS SCALED

XL	YL	XLOW	YLOW	XORG	YORG	XTIC	YTIC
22.00	24.00	-2.00	-8.00	0	0	1.00	4.00

IMARK	ISIZE	IPEN	ANUTT
15.00	3.00	1.00	2.00

PLOTTING CURVE 1

AXES NUMBERED

GRAPH ENCLOSED

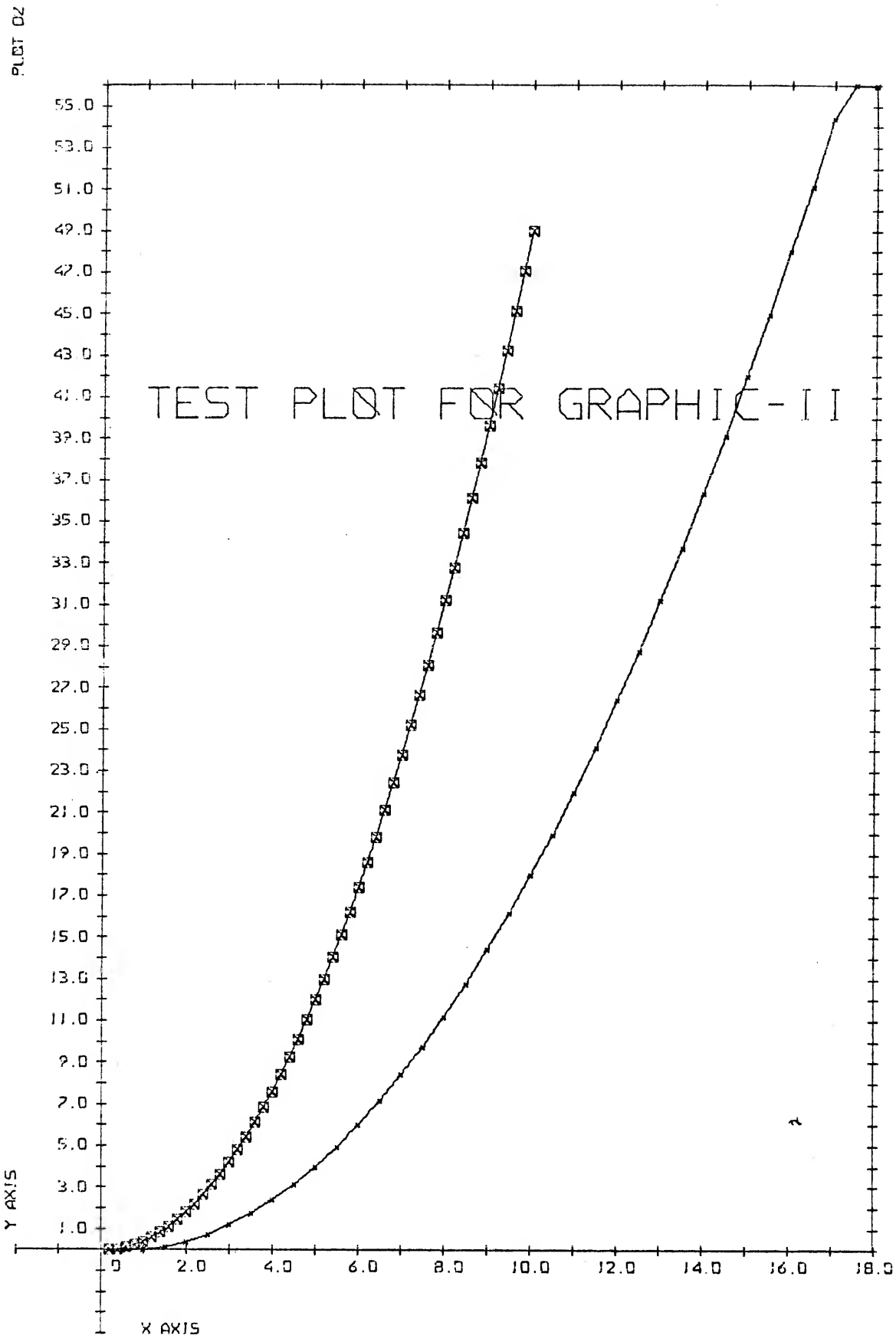
PLOTTING CURVE 2

PLOTTING CURVE 3

END OF GRAPHIC PLOT

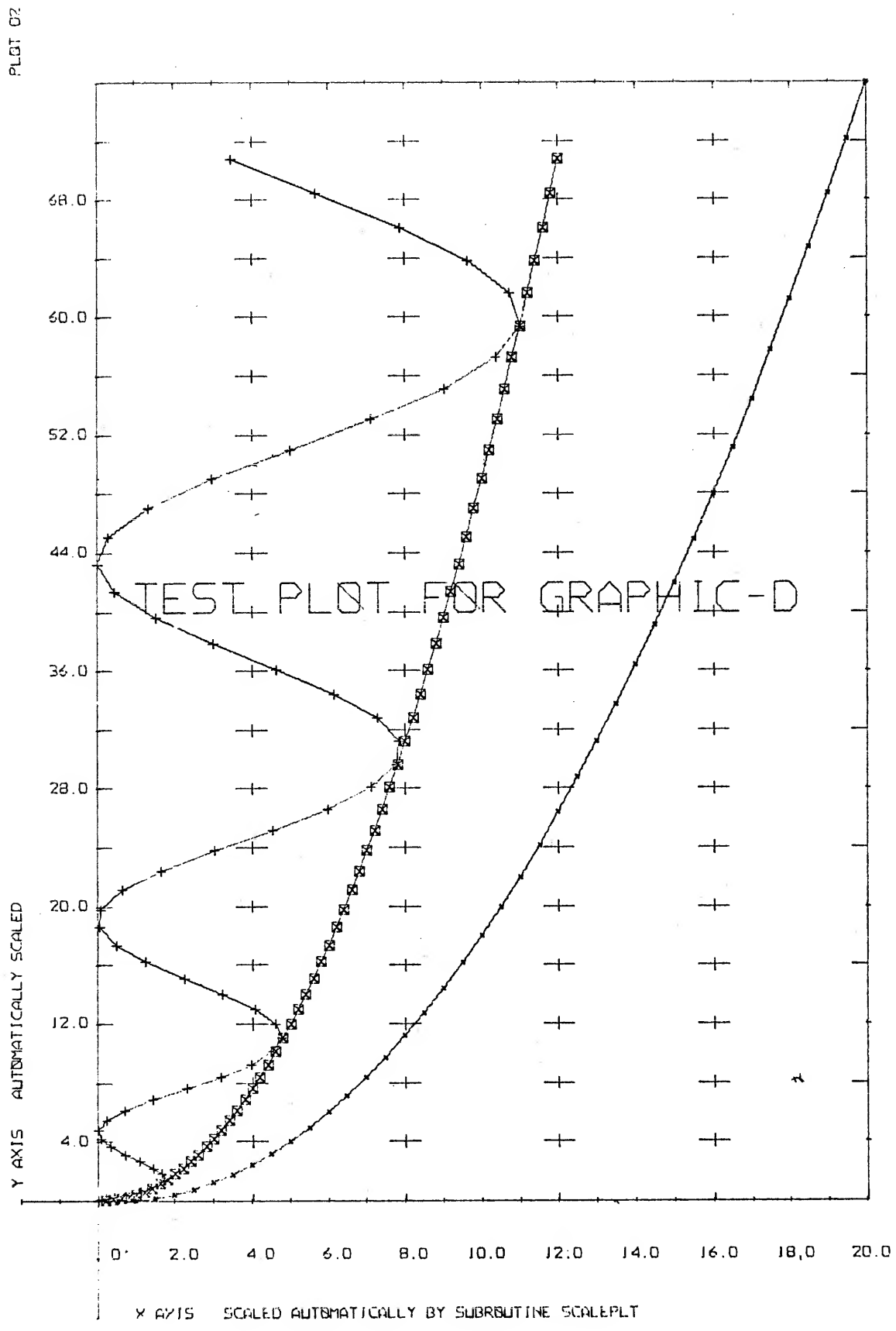
```
'EQUIP,2=*GRAPHIC
'EQUIP,3=*PLTSUBS
'EQUIP,16=PLOT
'FORTRAN,L,X
      PROGRAM TESTPLOT
      DIMENSION X(1000), Y(1000)
      DIMENSION LEGEND(60), PDATA(20)
      DIMENSION LIST(2)
C
C        ****************************
C        THIS PROGRAM PLOTS GRAPHIC-II
C
C         PDATA(1))=XL          PDATA(7)=XTIC
C         PDATA(2)=YL           PDATA(8)=YTIC
C         PDATA(3)=XLOW         PDATA(9)=NNT
C         PDATA(4)=YLOW         PDATA(10)=IDUP
C         PDATA(5)=XORG         PDATA(11)=IMARK
C         PDATA(6)=YORG         PDATA(12)=ISIZE
C                               PDATA(13)=IPEN
C                               PDATA(14)=AMULT
C        READ IN INPUT DATA FOR PLOT
      READ(60,100) (PDATA(I),I=1,10)
      PDATA(11) = 15.
      PDATA(12) = 3.
      PDATA(13) = 1.
      PDATA(14)=2.
C        WRITE OUT PLOT INPUT DATA
      WRITE(61,1) (PDATA(I), I = 1,10)
      WRITE(61,200) (PDATA(I),I=11,14)
 100  FORMAT(10E5.1)
 200  FORMAT(1H-,5X5HIMARK,5X5HISIZE,6X4HIPEN,5X5HAMULT,/4F10.2)
 1    FORMAT(1H1,8X2HXL,8X2HYL,6X4HXLOW,6X4HYLOW,6X4HXORG,6X4HYORG,6X4HX
     1TIC,6X4HYTIC,6X4H NNT,/10F10.2)
C        READ IN GRAPH TITLE
C        AND  LABELS FOR X AND Y AXIS
      READ(60,101) (LEGEND(I),I=1,60)
 101  FORMAT(I2,2I3,17A4,4X)
      LX = 7
      LY = 10
      LUN = 16
      NL=8
      LIST(1)=4HJO A
      LIST(2)=4HNN
      CALL NAME(LUN,LIST,NL)
      N = 50
      DO 10 I = 1,N
      X(I) = I
      X(I) = X(I)*.5
      Y(I) = (X(I)*X(I) - X(I))/5.
 10   CONTINUE
C        PLOT FIRST CURVE
      CALL GRAPHIC(X,Y,LEGEND,N,LX,LY,PDATA)
```

```
      CALL AXPLTF(LX,LY,PDATA)
C
      CALL ENCLOSE(PDATA)
C
      DO 20 I = 1,N
      X(I) = I
      X(I) = X(I)*.2
      Y(I) = (X(I)*X(I) - X(I)/5.)/2.
 20   CONTINUE
C        SET NEW DATA MARK
      PDATA(11) = 12.
C        PLOT SECOND CURVE
      PDATA(10) = 0.
      CALL DUPLOT (X,Y,LEGEND,N,8,11,PDATA)
 3    WRITE(61,2)
C
  2   FORMAT(1H-,19HEND OF GRAPHIC PLOT)
      CALL AXISXY(0,LX,LY,XTIC,XL,XLOW,YLOW,XORG,YORG)
      END
         FINIS
'LOAD,56,2,3
MAP
RUN
 20. 60. -2. -4. 0. 0. 1. 1. 1. 1.
 2  1 40   TEST PLOT FOR GRAPHIC-II
 1  2  2   X AXIS
 1  2  2   Y AXIS
''
'LOGOFF
```


PLOT 02
TEST PLOT FOR GRAPHIC-II
55.0
53.0
51.0
49.0
47.0
45.0
43.0
41.0
39.0
37.0
35.0
33.0
31.0
29.0
27.0
25.0
23.0
21.0
19.0
17.0
15.0
13.0
11.0
9.0
7.0
5.0
3.0
1.0
0
2.0
4.0
6.0
8.0
10.0
12.0
14.0
16.0
18.0
Y AXIS
X AXIS

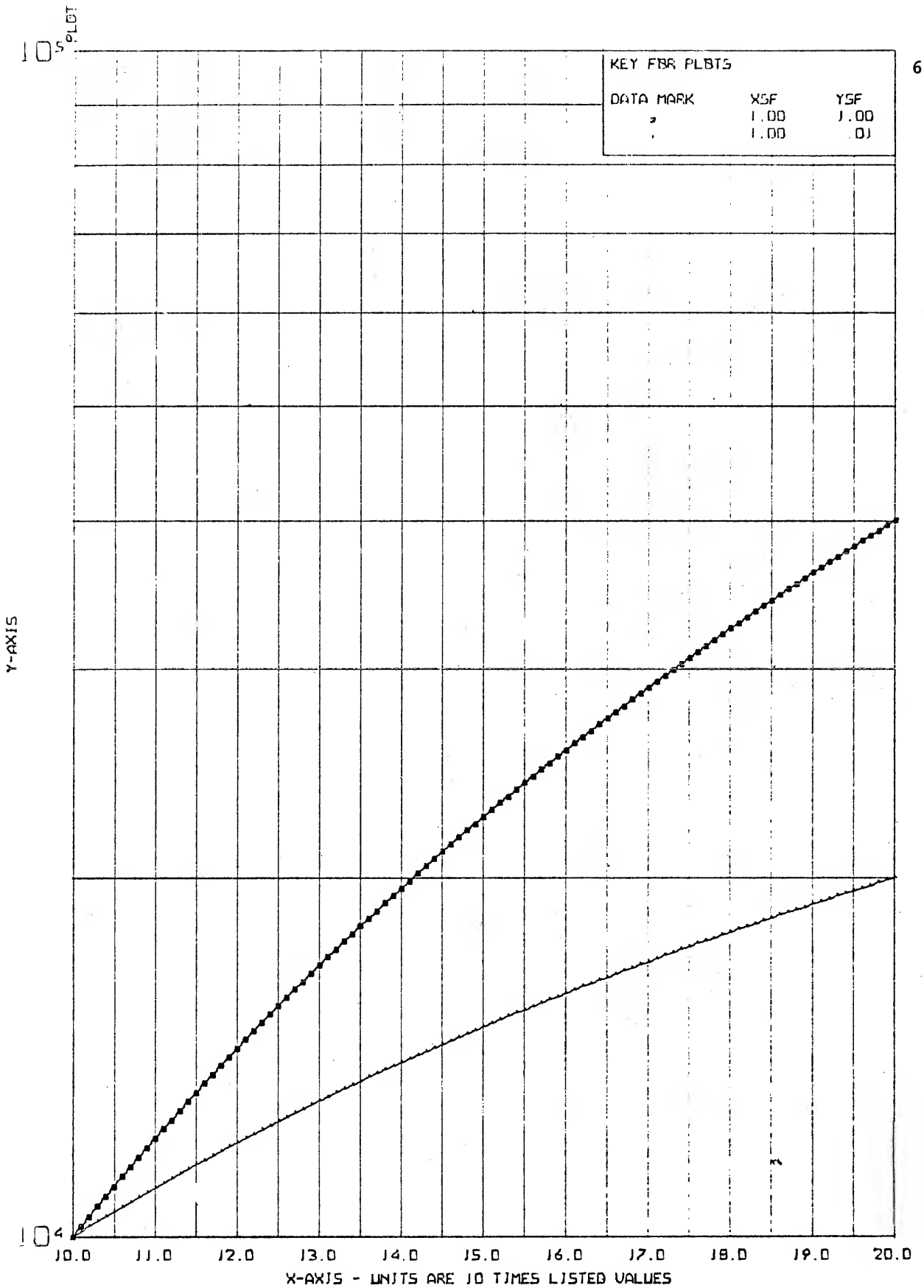
```
'EQUIP,2=*GRAPHIC
'EQUIP,3=*PLTSUBS
'EQUIP,16=PLOT
'MFBLKS=400
'TIME=200
'FORTRAN,L,X
      PROGRAM TESTPLOT
C        THIS PROGRAM PLOTS GRAPHIC-D
      DIMENSION X(1000), Y(1000)
      DIMENSION LEGEND(60), PDATA(20)
      DIMENSION LIST(2)
C
C        ****************************
C
C         PDATA(1))=XL          PDATA(7)=XTIC
C         PDATA(2)=YL           PDATA(8)=YTIC
C         PDATA(3)=XLOW         PDATA(9)=NNT
C         PDATA(4)=YLOW         PDATA(10)=IDUP
C         PDATA(5)=XORG         PDATA(11)=IMARK
C         PDATA(6)=YORG         PDATA(12)=ISIZE
C                               PDATA(13)=IPEN
C                               PDATA(14)=AMULT
      PDATA(10) = 1.
      PDATA(11) = 15.
      PDATA(12) = 3.
      PDATA(13) = 1.
      PDATA(14)=2.
C        WRITE OUT PLOT INPUT DATA
      WRITE(61,200) (PDATA(I),I=11,14)
 200  FORMAT(1H-,5X5HIMARK,5X5HISIZE,6X4HIPEN,5X5HAMULT,/4F10.2)
C        READ IN GRAPH TITLE
C        AND  LABELS FOR X AND Y AXIS
      READ(60,101) (LEGEND(I),I=1,60)
 101  FORMAT(I2,2I3,17A4,4X)
      LX = 7
      LY = 10
      LUN = 16
      NL=8
      LIST(1)=4HJO A
      LIST(2)=4HNN
      CALL NAME(LUN,LIST,NL)
      N=40
      DO 10 I = 1,N
      X(I) = I
      X(I) = X(I)*.5
      Y(I) = (X(I)*X(I) - X(I))/5.
 10   CONTINUE
C        SCALE FOR PLOTTING
      CALL SCALEPLT(X,Y,N  ,LX,LY,PDATA)
C
C        PLOT FIRST CURVE
      CALL GRAPHIC(X,Y,LEGEND,N,LX,LY,PDATA)
      CALL AXPLTF(LX,LY,PDATA)
C
      CALL GRIDMARK(4.,4.,PDATA)
C
      N= 60
      DO 20 I = 1,N
```

```
      X(I) = I
      X(I) = X(I)*.2
      Y(I) = (X(I)*X(I) - X(I)/5.)/2.
 20   CONTINUE
C        SET NEW DATA MARK
      PDATA(11) = 12.
C        PLOT SECOND CURVE
      CALL DUPLOT (X,Y,LEGEND,N,8,11,PDATA)
      DO 30 I = 1,N
      A = X(I)
      X(I) = X(I)*(SIN(A))*SIN(A)
   30 CONTINUE
      PDATA(10) = 0.
C         SET NEW DATA MARK PDATA(11)=10.
      PDATA(11)=10.
C         PLOT THIRD CURVE
      CALL DUPLOT (X,Y,LEGEND,N,8,11,PDATA)
 3    WRITE(61,2)
C
  2   FORMAT(1H-,19HEND OF GRAPHIC PLOT)
      CALL AXISXY(0,LX,LY,XTIC,XL,XLOW,YLOW,XORG,YORG)
      END
        FINIS
'LOAD,56,2,3
MAP
RUN
 2  1 40    TEST PLOT FOR GRAPHIC-D
 1  2  2    X AXIS   SCALED AUTOMATICALLY BY SUBROUTINE SCALEPLT
 1  2  2    Y AXIS   AUTOMATICALLY SCALED
''
'LOGOFF
```

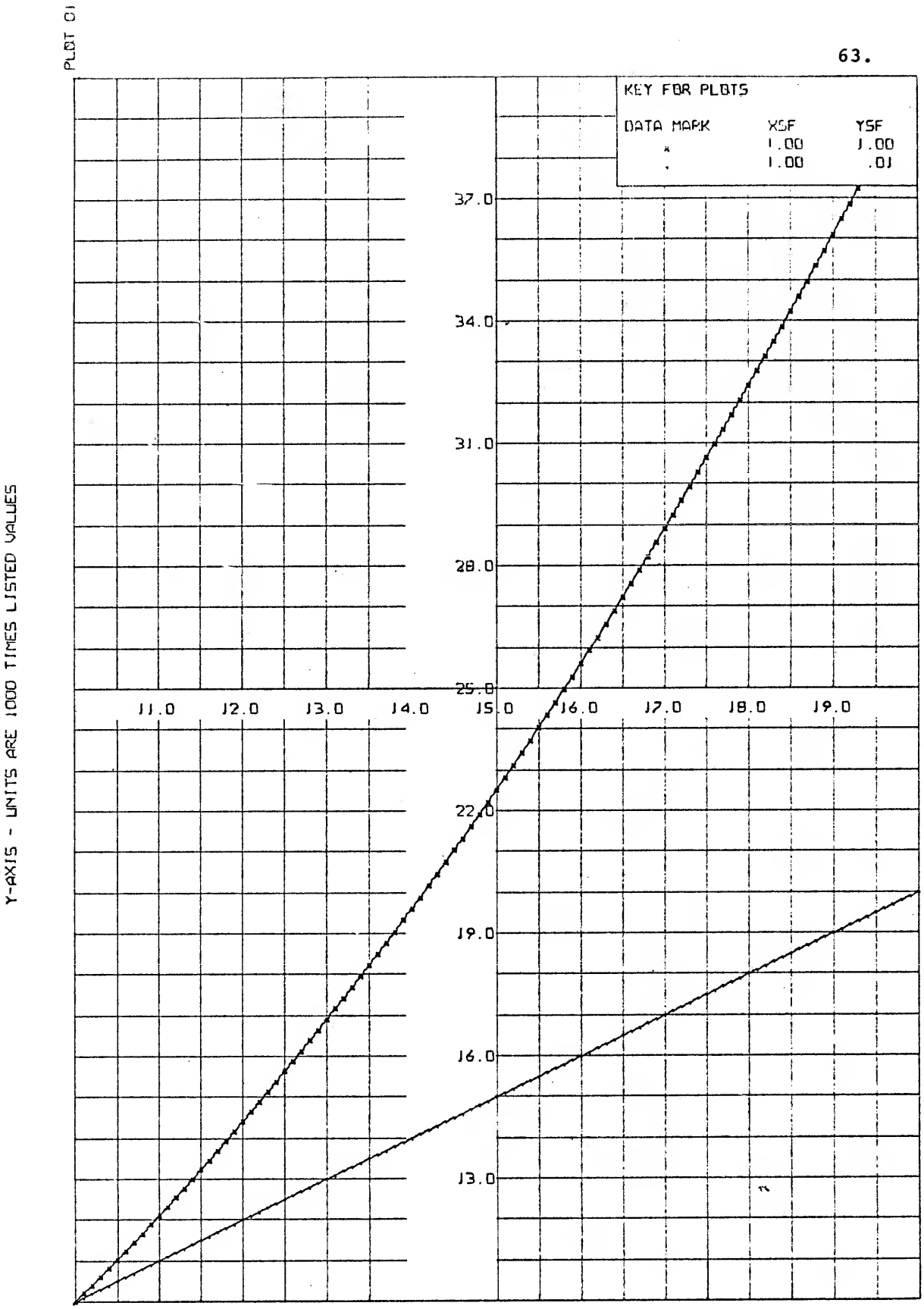

PLOT 02
TEST PLOT FOR GRAPHIC-D
68.0
60.0
52.0
44.0
36.0
28.0
20.0
12.0
4.0
Y AXIS AUTOMATICALLY SCALED
0.
2.0
4.0
6.0
8.0
10.0
12.0
14.0
16.0
18.0
20.0
X AXIS SCALED AUTOMATICALLY BY SUBROUTINE SCALEPLT

```
'EQUIP,1=PLOT
'LABEL,(1)/ SAVE FOR DEAN
'EQUIP,2=*PLTRTNS
'EQUIP,3=DATA
'EQUIP,4=*MLTIPLT
'EQUIP,5=*LOG1
'FORTRAN,L,X
      PROGRAM TEST
C          PLOTS 2 LINEAR GRAPHS AND 2 1-CYCLE SEMI-LOGSCALE GRAPHS
      COMMON IARRAY(12),ARRAY(22),LABELS(63)
      DIMENSION XDATA(101),YDATA(101)
      K=0
    5 READ(3,1)(XDATA(I),YDATA(I),I=1,101)
    1 FORMAT(2F5.2)
C          EQUIP,3= YOUR FILE PRIOR TO EXECUTION
      DO 100 I=1,12
  100 IARRAY(I)=FFIN(60)
      DO 200 I=1,22
  200 ARRAY(I)=FFIN(60)
      READ 3,(LABELS(I),I=1,60)
    3 FORMAT(20A4)
      DO 300 I=61,63
  300 LABELS(I)=FFIN(60)
      IF(K.EQ.1)GO TO 4
      CALL LOG1(XDATA,YDATA)
      CALL UNEQUIP(3)
      CALL EQUIP(3,5HDATA2)
      READ(3,1)(XDATA(I),YDATA(I),I=1,101)
      IARRAY(5)=21
      ARRAY(22)=.01
      CALL LOGA(XDATA,YDATA)
C          ENTRY POINT FOR SECOND GRAPH
      CALL AXISXY(0,0,0,0,0,0,0,0,0,0,0,0)
      CALL UNEQUIP(3)
      CALL EQUIP(3,5HDATA3)
      K=1
      GO TO 5
    4 CALL MLTIPLT(XDATA,YDATA)
      CALL UNEQUIP(3)
      CALL EQUIP(3,5HDATA4)
      READ(3,1)(XDATA(I),YDATA(I),I=1,101)
      IARRAY(5)=23
      ARRAY(22)=.01
      CALL GRAPH(XDATA,YDATA)
C          ENTRY POINT FOR SECOND GRAPH
      IF(AXISXY(0,0,0,0,0,0,0,0,0,0,0,0))2,2
    2 CALL EXIT
      END
''
```

```
'LOAD,56,2,4,5
RUN
2 101 1 1 11 1 3 2 0 1 7 10
100 0 100 0 100 0 5 0 10 0 1 0 100 0 10 0 100 10000 200 40000 1 1
Y-AXIS
X-AXIS - UNITS ARE 10 TIMES LISTED VALUES
PLOT 1 - Y=X**2, PLOT 2 - Y=X
6 41 29
2 101 1 1 15 1 3 1 0 1 7 10
100 30000 100 10000 150 5000 5 1000 10 10 1 3 100 10000 10 3000 100 10000
200 40000 1 1
Y-AXIS - UNITS ARE 1000 TIMES LISTED VALUES
X-AXIS - UNITS ARE 10 TIMES LISTED VALUES
PLOT 1 - Y=X**2, PLOT 2 - Y=X
43 41 29
''
'LOGOFF
```

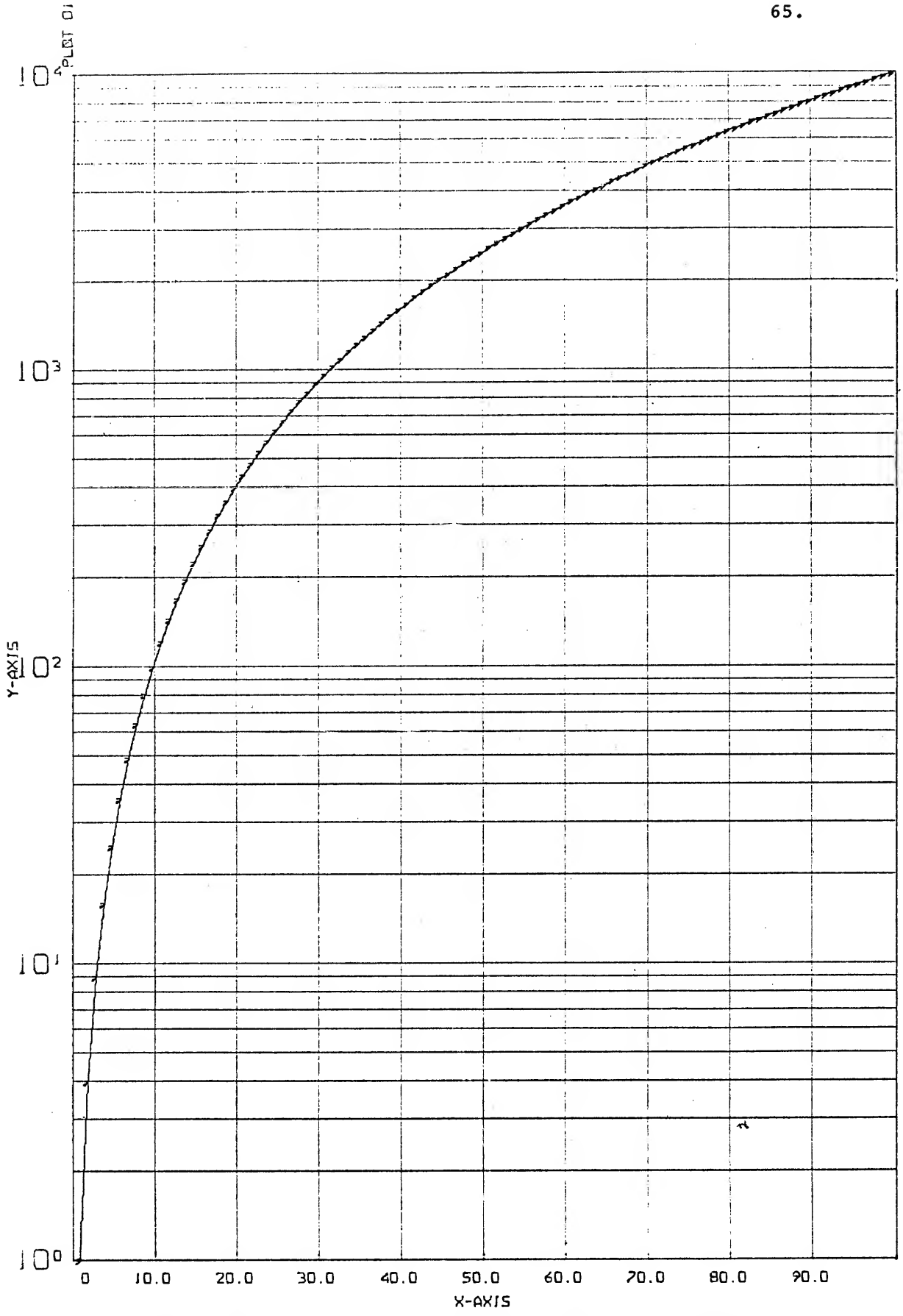


PLOT 1 - Y=X**2, PLOT 2 - Y=X



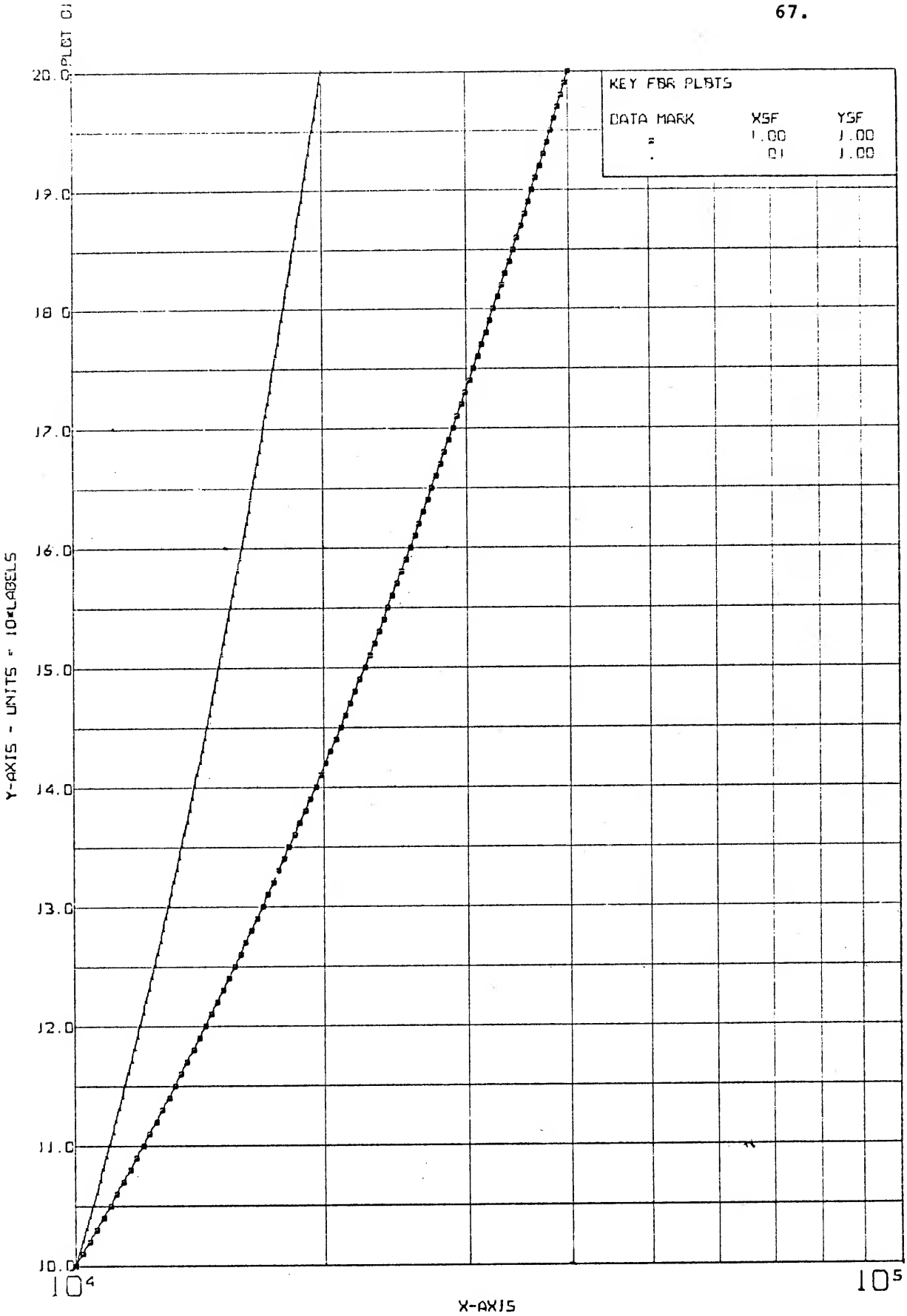
PLOT 1 - Y=X**2, PLOT 2 - Y=X

```
'EQUIP,1=PLOT
'LABEL,(1)/ SAVE FOR DEAN
'EQUIP,2=*PLTRTNS
'EQUIP,3=DATA
'EQUIP,4=*LOG1
'FORTRAN,L,X
      PROGRAM TEST1
C        PLOTS A 4-CYCLE SEMI-LOGSCALE GRAPH
      COMMON IARRAY(12),ARRAY(22),LABELS(63)
      DIMENSION XDATA(100),YDATA(100)
      READ(3,1)(XDATA(I),YDATA(I),I=1,100)
    1 FORMAT(2F5.2)
C          EQUIP,3= YOUR FILE PRIOR TO EXECUTION
      DO 100 I=1,12
  100 IARRAY(I)=FFIN(60)
      DO 200 I=1,22
  200 ARRAY(I)=FFIN(60)
      READ 3,(LABELS(I),I=1,60)
    3 FORMAT(20A4)
      DO 300 I=61,63
  300 LABELS(I)=FFIN(60)
      CALL LOG1(XDATA,YDATA)
      IF(AXISXY(0,0,0,0,0,0,0,0,0,0,0,0))2,2
    2 CALL EXIT
      END
''
'LOAD,56,2,4
RUN
1 100 0 1 19 1 3 2 0 1 7 10
100 0 0 0 0 0 10 0 0 0 10 0 0 0 10 0 1 1 100 10000 1 1
Y-AXIS
X-AXIS
THIS IS THE PLOT OF Y=X**2
6 6 26
''
'LOGOFF
```



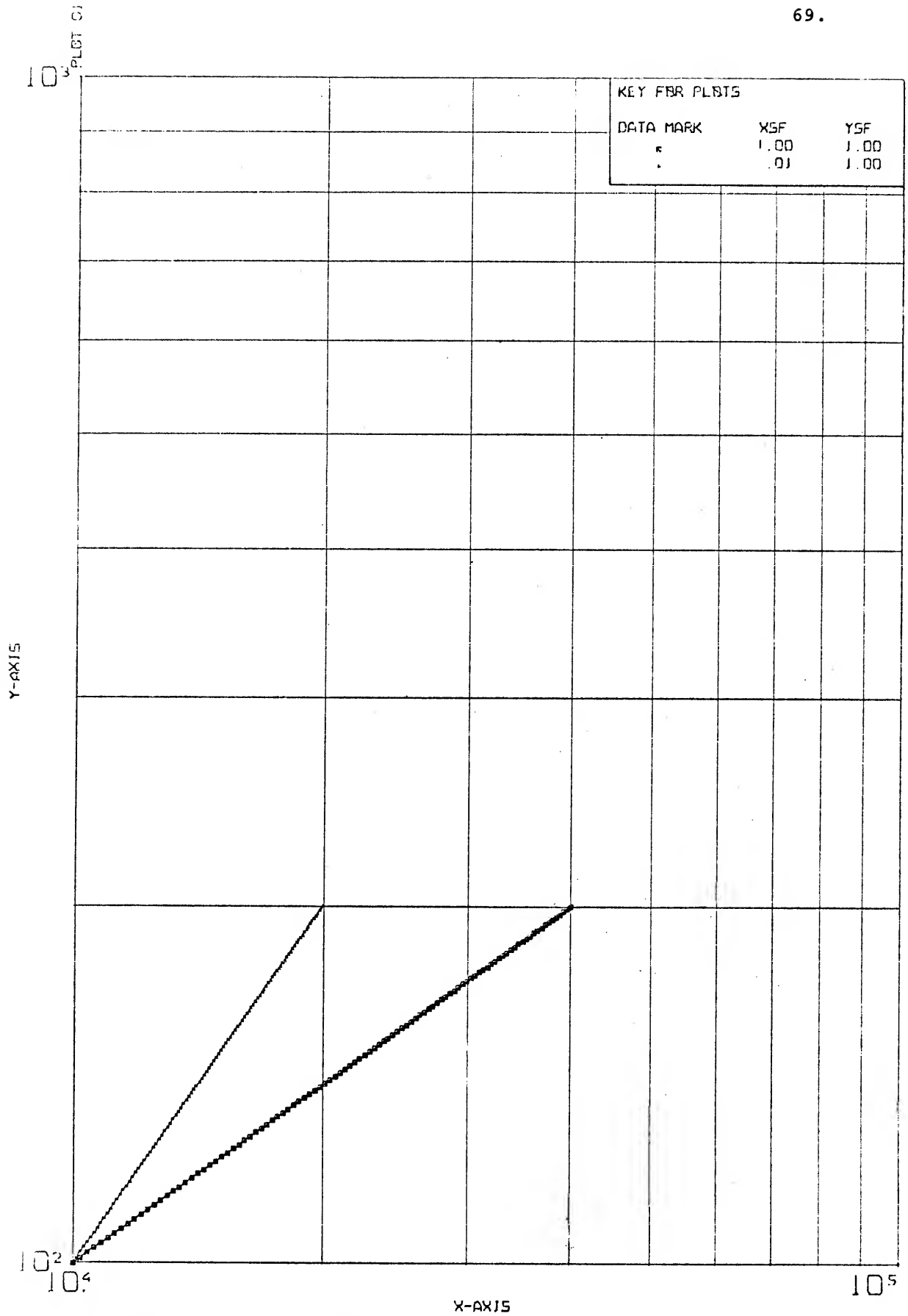
THIS IS THE PLOT OF Y=X**2

```
'EQUIP,1=PLOT
'LABEL,(1)/ SAVE FOR DEAN
'EQUIP,2=*PLTRTNS
'EQUIP,3=DATA
'EQUIP,4=*LOG2
'FORTRAN,L,X
      PROGRAM TEST2
C          PLOTS 2 1-CYCLE SEMI-LOGSCALE GRAPHS
      COMMON IARRAY(12),ARRAY(22),LABELS(63)
      DIMENSION XDATA(101),YDATA(101)
      READ(3,1)(XDATA(I),YDATA(I),I=1,101)
    1 FORMAT(2F5.2)
C          EQUIP,3= YOUR FILE PRIOR TO EXECUTION
      DO 100 I=1,12
  100 IARRAY(I)=FFIN(60)
      DO 200 I=1,22
  200 ARRAY(I)=FFIN(60)
      READ 3,(LABELS(I),I=1,60)
    3 FORMAT(20A4)
      DO 300 I=61,63
  300 LABELS(I)=FFIN(60)
      CALL LOG2(XDATA,YDATA)
      DO 400 I=1,101
  400 XDATA(I)=YDATA(I)
      IARRAY(5)=21
      ARRAY(22)=.01
      CALL LOGB(XDATA,YDATA)
C          ENTRY POINT FOR SECOND GRAPH
      IF(AXISXY(0,0,0,0,0,0,0,0,0,0,0,0))2,2
    2 CALL EXIT
      END
''
'LOAD,56,2,4
RUN
2 101 1 1 11 1 3 2 0 1 7 10
0 100 0 100 0 100 0 5 0 10 0 1 0 100 0 10 10000 100 40000 200 1 1
Y-AXIS - UNITS = 10*LABELS
X-AXIS
PLOT 1 - X=Y**2, PLOT 2 - X=Y
26 6 29
''
'LOGOFF
```



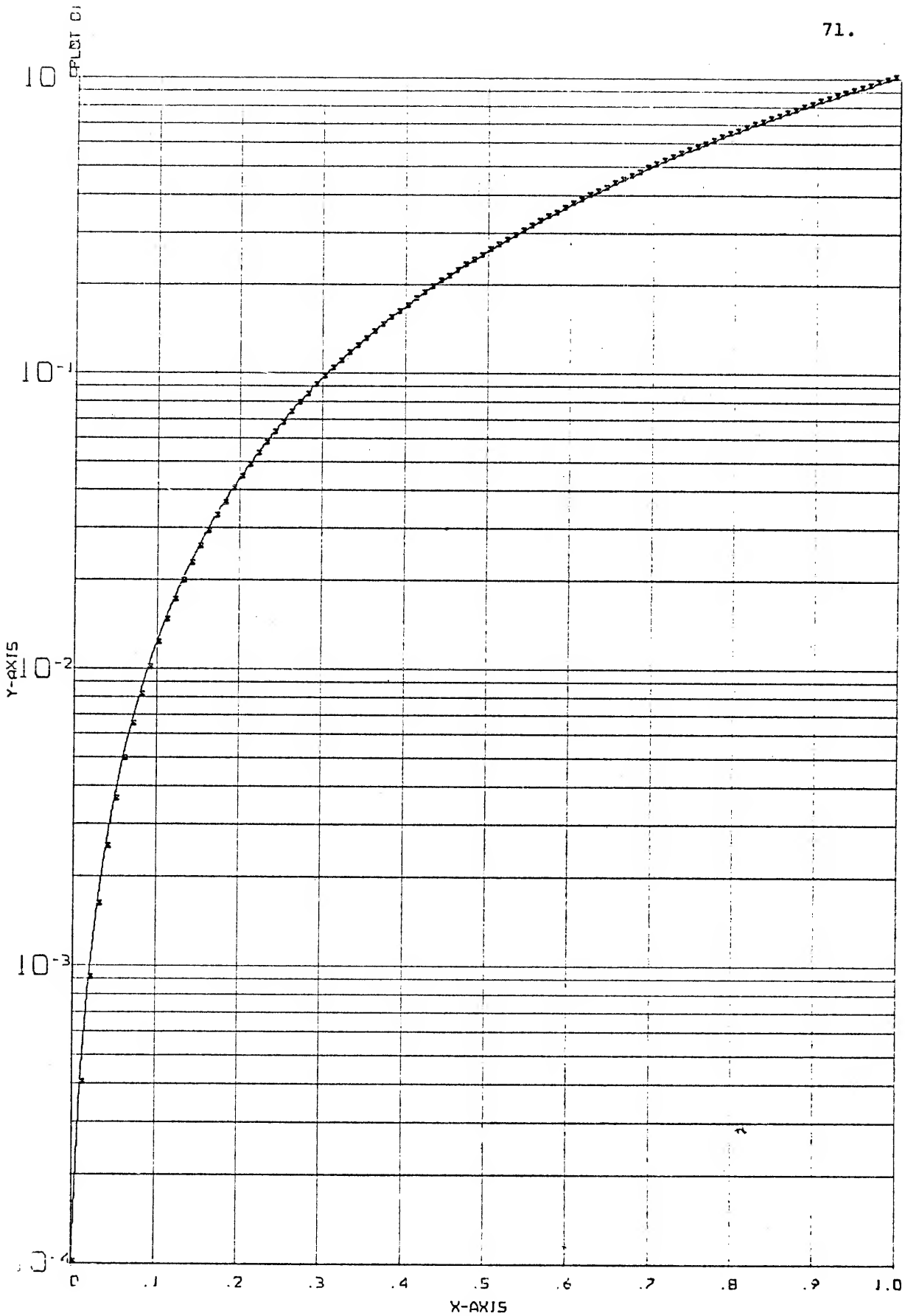
PLOT 1 - X=Y**2, PLOT 2 - X=Y

```
'EQUIP,1=PLOT
'LABEL,(1)/ SAVE FOR DEAN
'EQUIP,2=*PLTRTNS
'EQUIP,3=DATA
'EQUIP,4=*LOG3
'FORTRAN,L,X
      PROGRAM TEST3
C          PLOTS 2 1-CYCLE LOG-LOG GRAPHS
      COMMON IARRAY(12),ARRAY(6),LABELS(63)
      DIMENSION XDATA(101),YDATA(101)
      READ(3,1)(XDATA(I),YDATA(I),I=1,101)
    1 FORMAT(2F5.2)
C          EQUIP,3= YOUR FILE PRIOR TO EXECUTION
      DO 100 I=1,12
  100 IARRAY(I)=FFIN(60)
      DO 200 I=1,6
  200 ARRAY(I)=FFIN(60)
      READ 3,(LABELS(I),I=1,60)
    3 FORMAT(20A4)
      DO 300 I=61,63
  300 LABELS(I)=FFIN(60)
      CALL LOG3(XDATA,YDATA)
      DO 400 I=1,101
  400 XDATA(I)=YDATA(I)
      IARRAY(5)=21
      ARRAY(22)=.01
      CALL LOGC(XDATA,YDATA)
      IF(AXISXY(0,0,0,0,0,0,0,0,0,0,0,0))2,2
    2 CALL EXIT
      END
''
'LOAD,56,2,4
RUN
2 101 1 1 11 1 3 2 0 1 7 10
10000 100 40000 200 1 1
Y-AXIS
X-AXIS
PLOT 1 - X=Y**2, PLOT 2 - X=Y
6 6 29
''
'LOGOFF
```



PLOT 1 - X=Y**2, PLOT 2 - X=Y

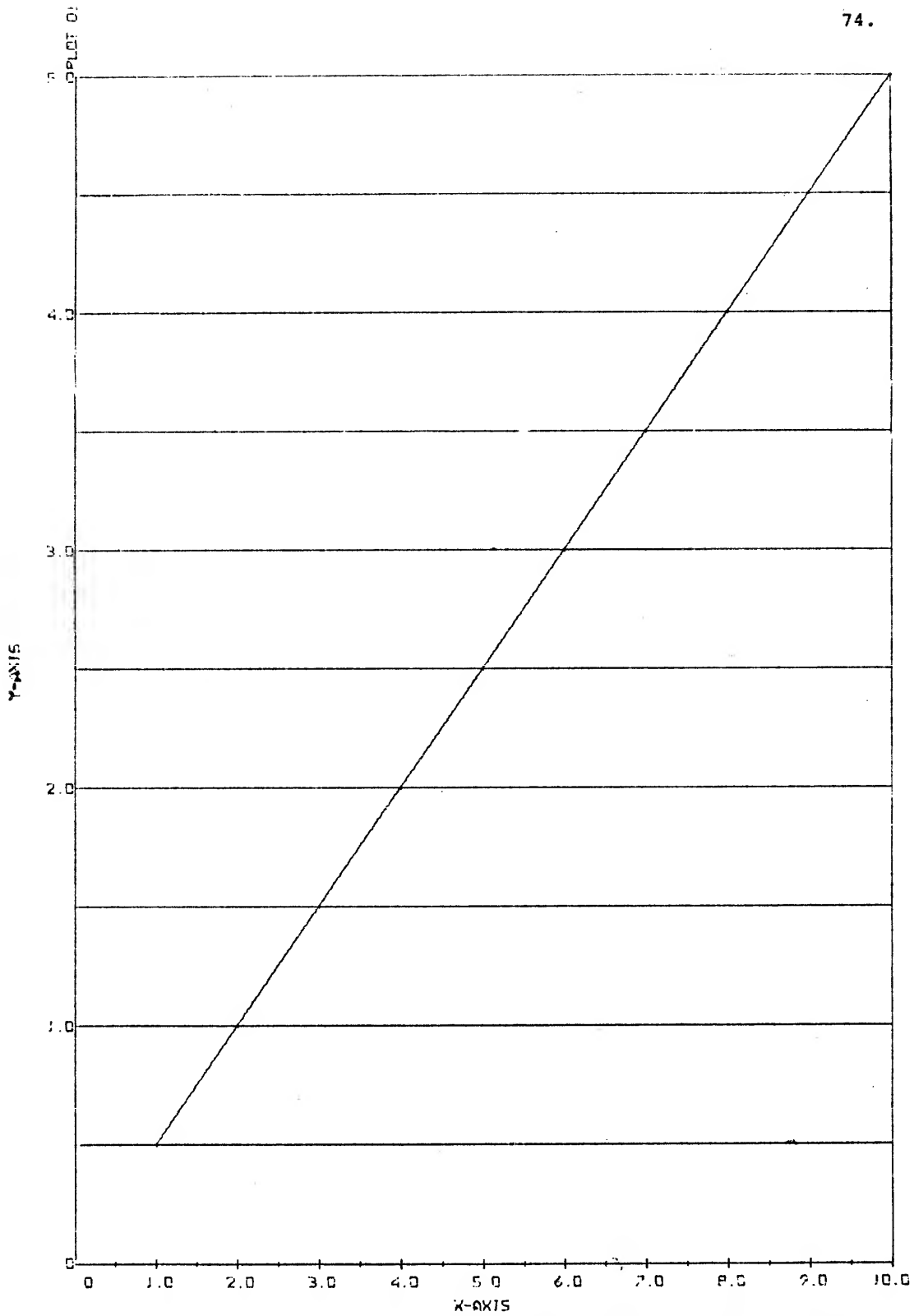
```
'EQUIP,1=PLOT
'LABEL,(1)/ SAVE FOR DEAN
'EQUIP,2=*PLTRTNS
'EQUIP,3=DATA
'EQUIP,4=*LOG1
'FORTRAN,L,X
      PROGRAM TEST4
C          PLOTS A 4-CYCLE SEMI-LOGSCALE GRAPH (VALUES GT 0 AND LE 1)
      COMMON IARRAY(12),ARRAY(22),LABELS(63)
      DIMENSION XDATA(100),YDATA(100)
      READ(3,1)(XDATA(I),YDATA(I),I=1,100)
    1 FORMAT(2F5.2)
C          EQUIP,3= YOUR FILE PRIOR TO EXECUTION
      DO 100 I=1,12
  100 IARRAY(I)=FFIN(60)
      DO 200 I=1,22
  200 ARRAY(I)=FFIN(60)
      READ 3,(LABELS(I),I=1,60)
    3 FORMAT(20A4)
      DO 300 I=61,63
  300 LABELS(I)=FFIN(60)
      CALL LOG1(XDATA,YDATA)
      IF(AXISXY(0,0,0,0,0,0,0,0,0,0,0))2,2
    2 CALL EXIT
      END
''
'LOAD,56,2,4
RUN
1 100 0 1 14 1 3 2 0 1 7 10
1 0 .01 0 .01 0 .1 0 0 0 .1 0 0 0 .1 0 .01 .0001 1 1 1 1
Y-AXIS
X-AXIS
THIS IS THE PLOT OF Y=X*M2
6 6 26
''
'LOGOFF
```



THIS IS THE PLOT OF Y=X**2

```
#EDIT

]FIN,PLT

]RESEQ

]LIST
00001:       PROGRAM PLT
00002:       COMMON IARRAY(12),ARRAY(22)
00003:       DIMENSION XDATA(10),YDATA(10)
00004:       READ(3,1)(XDATA(I),YDATA(I),I=1,10)
00005:     1 FORMAT(2F5.2)
00006:C          EQUIP,3= YOUR FILE PRIOR TO EXECUTION
00007:       PRINT 3
00008:     3 FORMAT(' PLEASE ENTER VALUES FOR INTEGER ARRAY(12)')
00009:       DO 100 I=1,12
00010:   100 IARRAY(I)=IFIX(FFIN(60))
00011:       PRINT 4
00012:     4 FORMAT(' THANK YOU. PLEASE ENTER VALUES FOR F.P. ARRAY(22)
')
00013:       DO 200 I=1,22
00014:   200 ARRAY(I)=FFIN(60)
00015:       PRINT 5
00016:     5 FORMAT(' THANK YOU. YOUR PLOT IS BEING EXECUTED.')
00017:       CALL MLTIPLT(XDATA,YDATA)
00018:       IF(AXISXY(0,0,0,0,0,0,0,0,0,0,0,0))2,2
00019:     2 CALL EXIT
00020:       END
00021:          FINIS

]EQUIP,1=PLOT

]EQUIP,2=PLTB

]EQUIP,3=DATA

]EQUIP,4=*MLTIPLT

]EQUIP,5=*PLTRTNS

]
#LABEL,1/SAVE FOR DEAN

#LOAD,2,4,5
```

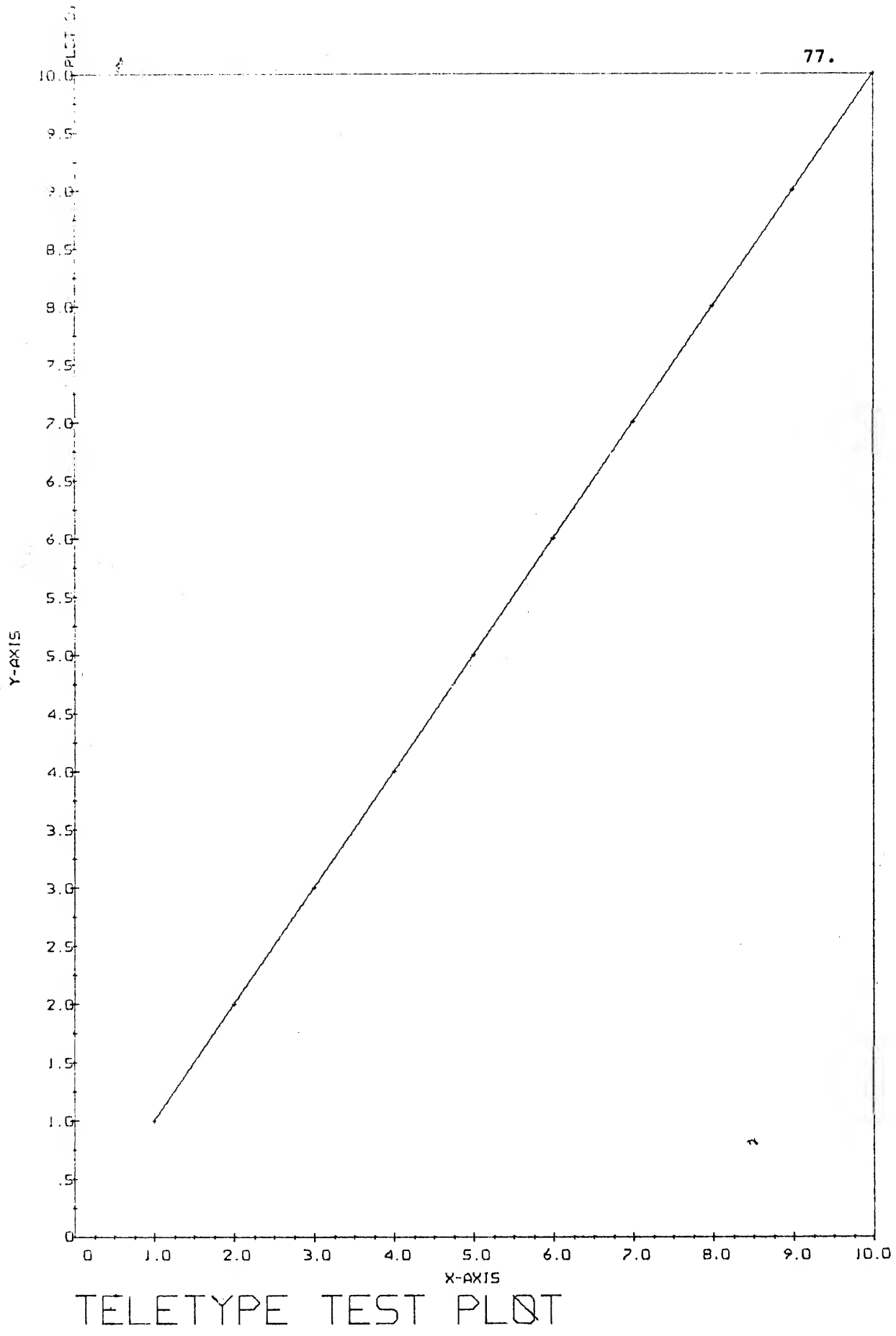
```
RUN
RUN



PLEASE ENTER VALUES FOR INTEGER ARRAY(12)
<> 1 10 0 1 9 1 1 2 2 1  7 10
THANK YOU. PLEASE ENTER VALUES FOR F.P. ARRAY(22)
<> 10 5 0 0 0 0 .5 .5 0 0 1 1 0 0 1 1 1 1 10 5 1 1
THANK YOU. YOUR PLOT IS BEING EXECUTED.
  LUN   LX    LY     XTIC       XL         YL        XLOW       YLOW
    1    7    10      .500    10.000      5.000          0          0

    XORG      YORG      YTIC   NNT
       0         0      .500     2
TYPE IN THE NUMBER OF COLUMNS IN YOUR THREE LABELS
IN THIS ORDER *** Y-AXIS, X-AXIS, AND PLOT LABELS. FORMAT 3I2
060634
THANK YOU. ON SEPARATE LINES PLEASE TYPE THE LABELS IN
THAT SAME ORDER.
Y-AXIS
X-AXIS
TEST PLOT OF *PLTRTNS AND *MLTIPLT




END OF FORTRAN EXECUTION

#LOGOFF
TIME 9.500 SECONDS  MFBLKS 21  COST $0.89
#
```



TEST PLOT OF *PLTRTNS AND *MLTIPLT

```
[illegible]
*EDIT

)TAPE
      PROGRAM PLT
      COMMON IARRAY(12),ARRAY(22),LABELS(33)
      DIMENSION XDATA(10),YDATA(10)
      DO 100 I=1,10
      XDATA(I)=FFIN(3)
  100 YDATA(I)=FFIN(3)
      PRINT3
    3 FORMAT(' PLEASE ENTER VALUES FOR INTEGER ARRAY(12)')
      DO 200 I=1,12
  200 IARRAY(I)=FFIN(30)
      PRINT 4
    4 FORMAT(' THANK YOU. PLEASE ENTER VALUES FOR F.P. ARRAY(22)')
      DO 300 I=1,22
  300 ARRAY(I)=FFIN(30)
      PRINT 6
    6 FORMAT(' NOW TYPE IN THE Y-AXIS LABEL.')
      READ 7,(LABELS(I),I=1,20)
    7 FORMAT(20A4)
      PRINT8
    8 FORMAT(/' THE X-AXIS LABEL.')
      READ 7,(LABELS(I),I=21,40)
      PRINT 9
    9 FORMAT(/' THE PLOT LABEL.')
      READ 7,(LABELS(I),I=41,60)
      PRINT 10
   10 FORMAT(/' FINALLY, TYPE IN THE NUMBER OF CHARACTERS AND'
     1' SPACES'/' IN THE ABOVE 3 LABELS IN THAT SAME ORDER.')
      DO 400 I=61,63
  400 LABELS(I)=FFIN(30)
      PRINT 5
    5 FORMAT(' THANK YOU. YOUR PLOT IS BEING EXECUTED.'///)
      CALL MLTIPLT(XDATA,YDATA)
      CALL AXISNY(0,0,5,0,,0,0,,0,0,0,0)
      CALL EXIT
      END
         FINIS

]
/LOGOFF
TIME 4.960 SECONDS  [FOLKS 5  COST $0.35
#
```

```
#EQUIP,1=PLOT
#EQUIP,2=*MLTIPLT
#EQUIP,3=DATA
#EQUIP,4=*PLTRTNS
#EQUIP,5=PLTB
#LABEL,1/ SAVE FOR DEAN

#LOAD,2,4,5
RUN
RUN



PLEASE ENTER VALUES FOR INTEGER ARRAY(12)
<> 1 10 0 1 9 6 3 2
<> 4 1 7 10
THANK YOU. PLEASE ENTER VALUES FOR F.P. ARRAY(22)
<> 10 10 0 0 0 0 .25 .25
<> 0 0 1 .5 0 0 1 .5
<> 1 1 10 10 1 1
NOW TYPE IN THE Y-AXIS LABEL.
Y-AXIS

THE X-AXIS LABEL.
X-AXIS

THE PLOT LABEL.
TELETYPE TEST PLOT

FINALLY, TYPE IN THE NUMBER OF CHARACTERS AND SPACES
IN THE ABOVE 3 LABELS IN THAT SAME ORDER.
<> 6 6 18
THANK YOU. YOUR PLOT IS BEING EXECUTED.


  LUN    LX     LY      XTIC         XL          YL         XLOW        YLOW
    1     7     10       .250     10.000      10.000            0

     XORG       YORG       YTIC    NNT
        0          0       .250      4



END OF FORTRAN EXECUTION

#LOGOFF
TIME 7.942 SECONDS  NFBLKS 14  COST $0.70
#
```



TELETYPE TEST PLOT